JRC Scientific and Technical Reports

Scientific, Technical and Economic Committee for Fisheries (STECF)

REVIEW OF SCIENTIFIC ADVICE FOR 2010 Part 2

Advice on Stocks of Interest to the European Community in areas under the jurisdiction of CCAMLR, CECAF, WECAF, ICCAT, IOTC, IAATC, GFCM, NAFO, and stocks in the North East Atlantic assessed by ICES.

Prepared in draft by the STECF-SG-ECA/RST-09-03, Vigo, Spain 19 – 23 October 2009.

Edited by John Casey, Willy Vanhee & Jean-Noel Druon

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SCIENTIFIC, TECHNICAL AND ECONOMIC COMMITTEE FOR FISHERIES (STECF)

STECF COMMENTS ON THE REPORT OF THE SG-ECA/RST-09—03 WORKING GROUP

Vigo, Spain 19-23 October 2009

STECF UNDERTOOK THE REVIEW DURING THE PLENARY MEETING

HELD IN BRUSSELS 9-13 NOVEMBER 2009

Review of scientific advice on stocks of Community interest – part 2

STECF is requested to review the report of the SG-ECA/RST-09-03 of 19-23 October 2009 (Vigo) meeting, evaluate the findings and make any appropriate comments and recommendations.

SG-ECA/RST- 09-03 WORKING GROUP REPORT

REVIEW OF SCIENTIFIC ADVICE FOR 2010 – part 2

Vigo, Spain 19-23 October 2009

This report was reviewed and endorsed by the STECF at its 32nd plenary session in November 2009.

This report does not necessarily reflect the view of the European Commission and in no way anticipates the Commission's future policy in this area

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REVIEW OF SCIENTIFIC ADVICE FOR 2010 PART 2

General request to STECF

STECF is requested to review the most recent advice on stocks of interest to the European Community and provide and appropriate comments and recommendations. STECF is requested, in particular, to highlight any inconsistencies in assessments and advice, taking into account any additional information available. STECF is also requested to take account of data and information in the reports of any relevant assessment WGs.

In undertaking its review and providing advice, STECF is additionslly requested to take into account the Harvest Control Rules adopted in recovery plans, management plans and long-term plans or Harvest Control Rules suggested in the Communication from the Commission (COM (2009) 224) on a Consultation on fishing opportunities for 2010.

Introduction to the STECF Review of Advice for 2010 Part 2

Background

This report represents the STECF review of advice for stocks of interest to the European Community in areas under the jurisdiction of CCAMLR, CECAF, WECAF, ICCAT, IOTC, IAATC, GFCM, NAFO, and stocks in the North East Atlantic assessed by ICES and was endorsed by the STECF at its 32nd Plenary meeting held in Brussels from 9-13 November 2009. Parts 1 and 2 will be combined and published in the STECF Consolidated review of advice for 2010, which will be available in November 2009.

In undertaking the review, STECF has consulted the most recent reports on stock assessments and advice from appropriate scientific advisory bodies or other readily available literature, and has attempted to summarise it in a common format. For some stocks the review remains unchanged from the Review of advice for 2009 (STECF, 2009, EUR 23630 EN), since no new information on the status of or advice for such stocks was available at the time the present review took place.

STECF notes that the term 'stock' in some cases, may not reflect a likely biological unit, but rather a convenient management unit. In specific cases STECF has drawn attention to this fact. STECF also is of the opinion that, as far as possible, management areas should coincide with stock assessment areas.

For the first time STECF was requested by the Commission to estimate the the TACs corresponding to the decision rules contained in the Commission's Communication on Fishing Opportunities for 2010 (COM (2009) 224.

For each stock, a summary of the following information is provided:

STOCK: [Species name, scientific name], [management area]

FISHERIES: fleets prosecuting the stock, management body in charge, economic importance in relation to other fisheries, historical development of the fishery, potential of the stock in relation to reference points or historical catches, current catch (EU fleets' total), any other pertinent information.

SOURCE OF MANAGEMENT ADVICE: reference to the management advisory body.

MANAGEMENT AGREEMENT: where these exist.

PRECAUTIONARY REFERENCE POINTS: where these have been proposed.

STOCK STATUS: Reference points, current stock status in relation to these. STECF has included precautionary reference point wherever these are available.

RECENT MANAGEMENT ADVICE: summary of advice.

STECF COMMENTS: Any comments STECF thinks worthy of mention, including errors, omissions or disagreement with assessments or advice.

FISHING OPPORTUNITIES FOR 2010 according to COM (2009) 224: The TACs corresponding the to TAC decision rules contained in COM (2009) 224.

Application of the rules for calculating TACs according to the Commission's Communication on Fishing opportunities for 2010 (COM (2009) 224)

STECF has adopted the following procedure in providing options for fishing opportunities for 2010 according to COM (2009) 224.

Options when a management plan is in place or proposed.

1. If the management plan has been evaluated and has been deemed to consistent with the precautionary approach, STECF has advised on the level of TAC corresponding to the relevant harvest control rule contained in the plan.
2. If the management plan has not yet been evaluated or the evaluation was inconclusive with respect to the precautionary approach, STECF has noted the level of TAC corresponding to the relevant harvest control rule contained in the plan.
3. If the management plan has been evaluated and has been deemed not to be consistent with the precautionary approach, STECF has noted the level of TAC corresponding to the relevant harvest control rule contained in the plan. In this case, STECF also provides options for TACs according to the Communication from the Commission (COM (2009) 224) on a consultation on fishing opportunities for 2010.

Options when there is no management plan in place or proposed.

4. In such circumstances STECF provides options for TACs according to the Communication from the Commission (COM (2009) 224) on a consultation on fishing opportunities for 2010

While recognising that some stocks are shared resources and the EU may only obtain a share of the overall TAC, the values for 2010 TACs provided in the report according to COM (2009) 224 apply to the overall TAC and not the any anticipated EU share. This is because STECF has no advance information on what share is likely to be negotiated. Note also that the TAC values provided by STECF in accordance with COM (2009) 224 should not be considered as STECF-advice, unless it is explicitly stated as such in the report sections.

The STECF review of scientific advice for 2009 Part 2 was drafted by the STECF Sub-groups on Resource Status (SGRST 09-02) held in Vigo, Spain from 19 – 23 October 2009.

STECF acknowledges the extensive contribution made by the following participants:

Participants SG-ECA/RST 09-03 meeting in Vigo, Spain, 19 – 23 October 2009:

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1. Stocks in the Northeast Atlantic assessed by ICES

1.1. Horse mackerel (*Trachurus trachurus*) in the North Sea (Divisions IIIa eastern part, IVbc, VIId).

FISHERY: Catches taken in Divisions IVb,c and VIId are regarded as belonging to the North Sea horse mackerel and in some years also catches from Division IIIa - except the western part of Skagerrak. The total catch taken from this stock in 2008 was 34,749 tonnes. In previous years most of the catches from the North Sea stock were taken as a by-catch in the small mesh industrial fisheries in the fourth quarter carried out mainly in Divisions IVb and VIId, but in recent years a large part of the catch was taken in a directed horse mackerel fishery for human consumption.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is ICES.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points are set for this stock, as there is insufficient information to estimate reference points.

STOCK STATUS: The available information is inadequate to evaluate spawning stock or fishing mortality relative to risk, so the state of the stock is unknown. Catches increased rapidly in late 1990s and have remained high since.

RECENT MANAGEMENT ADVICE: ICES reiterates the recommendation made since 2002 to limit the catches to below the 1982-1997 average of 18 000 t. It is necessary to constrain the fishery until there is more information about the structure of horse mackerel stocks, and sufficient information to show that higher exploitation rates are sustainable. Most of the catch of North Sea horse mackerel is taken in ICES Division VIId (90% in 2008). It is a key problem that the TAC for the western stock is allocated to this ICES division, but catches from this area are of North Sea horse mackerel.

- The current management units are incompatible with the stock units. The advice for horse mackerel assumes that all catches are counted against the TAC for each stock separately. In 2008 and before, the TAC covered only part of the distribution and fishing areas (EU waters). ICES advises that the management areas correspond to the distribution areas which include all EU, Norwegian, and Faroes waters where horse mackerel are caught. ICES further advises: The TAC for western horse mackerel should apply to all areas where western horse mackerel is caught (EU, Norwegian, and Faroes waters) and where necessary be subject to agreement.
- Catches from ICES Division VIId should be taken against a TAC for the North Sea stock.
- Catches taken in Division VIIIc need to be taken against a TAC for the western stock.

A directed juvenile fishery occurs in all three horse mackerel stocks, and measures should be taken to ensure that misreporting of juvenile catch taken in Divisions VIIe,h and VIId (the latter then belonging to the North Sea stock management area) is effectively hindered.

In June 2009, an agreement was concluded between contracting parties to the Coastal States on mackerel banning highgrading, discarding, and slipping from pelagic fisheries targeting mackerel, horse mackerel, and herring beginning in January 2010.

STECF COMMENTS: STECF agrees with the advice from ICES.

FISHING OPPORTUNITIES FOR 2010 ACCORDING TO ANNEX II OF COM(2009) 224

With the background of the latest scientific assessments and advice and with reference to the Communication from the Commission COM(2009) 224 on a consultation on fishing opportunities for 2010, STECF notes that Horse Mackerel Division IIIa (eastern part), Subarea IV and Division VIId can be classified under Category 6.

Accordingly STECF notes that the rule for the above category implies the following option for TACs in 2010.

Category 6 State of the stock is not known; advice on appropriate catch

2010 TAC	Basis

Category 6 33,413 t State of the stock is unknown, Annex III, rule 1, -15% TAC constraint

1.2. Mackerel (*Scomber scombrus*) - combined Southern, Western and North Sea spawning components)

ICES currently uses the term North East Atlantic Mackerel to define the mackerel present in the area extending from ICES Division IXa in the south to Division IIa in the north, including mackerel in the North Sea and Division IIIa. The spawning areas of mackerel are widely spread, and only the stock in the North Sea is sufficiently distinct to be clearly identified as a separate spawning component. Tagging experiments have demonstrated that after spawning, fish from Southern and Western areas migrate to feed in the Norwegian Sea and the North Sea during the second half of the year. In the North Sea they mix with the North Sea component. Since it is currently impossible to allocate catches to the stocks previously considered by ICES, they are at present, for practical reasons, considered as one stock: the North East Atlantic Mackerel Stock. Catches cannot be allocated specifically to spawning area components on biological grounds, but by convention the catches from the Southern and Western components are separated according to the area in which they are taken.

In order to be able to keep track of the development of the spawning biomasses in the different spawning areas, the North East Atlantic mackerel stock is divided into three area components: the Western Spawning Component, the North Sea Spawning Component**,** and the Southern Spawning Component. The Western Component is defined as mackerel spawning in the western area (ICES Divisions and Subareas VI, VII, and Divisions VIII a,b,d,e). This component currently comprises 81% of the entire North East Atlantic stock. Similarly, the Southern Component is defined as mackerel spawning in the southern area (ICES Divisions VIIIc and IXa).

Although the North Sea component has been at an extremely low level since the early 1970s, ACOM regards the North Sea Component as still existing. This component spawns in the North Sea and Skagerrak (ICES Subarea IV and Division IIIa). Current knowledge of the state of the spawning components is summarized below.

Western Component: The catches of this component were low in the 1960s, but increased to more than 800 000 t in 1993. The main catches are taken in directed fisheries by purse-seiners and mid-water trawlers. Large catches of the western component are taken in the northern North Sea and in the Norwegian Sea. The 1996 catch was reduced by about 200 000 t compared with 1995, because of a reduction in the TAC. The catches since 1998 have been stable. The SSB of the Western Component declined in the 1970s from above 3.0 million t to 2.2 million t in 1994, but was estimated to have increased to 2.7 million t in 1999. A separate assessment for this stock component is no longer required, as a recent extension of the time-series of NEA mackerel data now allows the estimation of the mean recruitment from 1972 onwards. Estimates of the spawning-stock biomass, derived from egg surveys, indicate a decrease of 14% between 1998 and 2001 and a 6% decrease from 2001 to the 2004 survey. The results from 2007 indicate a 5 % increase from 2004 to 2007.

North Sea Component: Very large catches were taken in the 1960s in the purse-seine fishery, reaching a maximum of about 1 million t in 1967. The component subsequently collapsed and catches declined to less than 100 000 t in the late 1970s. Catches during the last five years have been assumed to be about 10 000 t. The 2002 and 2005 triennial egg surveys in the North Sea both indicate similar egg production, but in 2008 it has decreased by about 40%.

Southern Component: Mackerel is a target species for the hand line fleet during the spawning season in Division VIIIc, during which about one-third of the total catches are taken. It is taken as a bycatch in other fleets. The highest catches (87%) from the Southern Component are taken in the first half of the year, mainly from Division VIIIc, and consist of adult fish. In the second half of the year catches consist of juveniles and are mainly taken in Division IXa. Catches from the Southern Component increased from about 20 000 t in the early 1990s to 44 000 t in 1998, and were close to 50 000 t in 2002. Estimates of the spawning-stock biomass, derived from egg surveys, are highly variable, and give average estimates of around 16% of the combined NEA mackerel stock (1995–2007).

SOURCE OF MANAGEMENT ADVICE: The advisory body is ICES. This assessment is based on catch numbers-at-age for the period 1972 to 2008 and triennial egg survey estimates of SSB from 1992 to 2007. Estimating proportions of catch discarded and slipped is problematic in pelagic fisheries due to high variability

in discard and slipping practices. Recently information on these practices has been improving; current estimates from sampled fleets indicate that discarding is a small percentage of the total. Recruit surveys provide information on the distribution of young mackerel, but are subject to high variability and have not proved useful in estimating year-class strength.

PRECAUTIONARY REFERENCE POINTS:

The proposed precautionary reference points for fishing mortality and biomass are F_{pa} =0.23, F_{lim} = 0.42, B_{pa} =2.3 million t, B_{lim} =1.67 million t

STOCK STATUS:
Based on the most recent estimate of SSB (in 2009), ICES classifies this stock as having full reproductive capacity. Based on the most recent estimates of fishing mortality (in 2008), ICES classifies the stock as being harvested at increased risk.
Fishing mortality in 2008 is estimated to be just above F_{pa}. SSB has increased by 47% since 2002 and is currently estimated to be above B_{pa}. The 2002 year class is the highest on record. Subsequent year classes are estimated to be about average. There is insufficient information to confirm the sizes of the 2007 and 2008 year-classes.

MANAGEMENT AGREEMENTS:

A new management plan was agreed by Norway, Faroe Islands and the EU in October 2008. ICES evaluated the plan and concluded that the plan is precautionary under the assumption that the TAC equals the total removals from the stock.

1. *For the purpose of this long-term management plan, "SSB" means the estimate according to ICES of the spawning stock biomass at spawning time in the year in which the TAC applies, taking account of the expected catch.*

2. *When the SSB is above 2,200,000 tonnes, the TAC shall be fixed according to the expected landings, as advised by ICES, on fishing the stock consistent with a fishing mortality rate in the range of 0.20 to 0.22 for appropriate age groups as defined by ICES.*

3. *When the SSB is lower than 2,200,000 tonnes, the TAC shall be fixed according to the expected landings as advised by ICES, on fishing the stock at a fishing mortality rate determined by the following:*

   Fishing mortality F = 0.22 SSB/ 2,200,000*

4. *Notwithstanding paragraph 2, the TAC shall not be changed by more than 20% from one year to the next, including from 2009 to 2010.*

5. *In the event that the ICES estimate of SSB is less than 1,670,000 tonnes, the Parties shall decide on a TAC which is less than that arising from the application of paragraphs 2 to 4.*

6. *The Parties may decide on a TAC that is lower than that determined by paragraphs 2 to 4.*

7. *The Parties shall, as appropriate, review and revise these management measures and strategies on the basis of any new advice provided by ICES*

RECENT MANAGEMENT ADVICE: ICES advises that any agreed TAC should cover all areas where Northeast Atlantic mackerel are fished. The agreed management plan (F between 0.2 and 0.22) would imply catches between 527 000 t and 572 000 t in 2010. The SSB is expected to remain stable in 2011 for a catch in this range

ICES further advises that the existing measures to protect the North Sea spawning component remain in place. These are:

- There should be no fishing for mackerel in Divisions IIIa and IVb,c at any time of the year;

- There should be no fishing for mackerel in Division IVa during the period 15 February 31 July;

- The 30-cm minimum landing size at present in force in Subarea IV should be maintained.

In June 2009, an agreement was concluded between contracting parties to the Coastal States on mackerel banning highgrading, discarding, and slipping from pelagic fisheries targeting mackerel, horse mackerel, and herring beginning in January 2010.

STECF COMMENTS: STECF agrees with ICES.

FISHING OPPORTUNITIES FOR 2010 ACCORDING TO THE AGREED NORWAY, EU AND FAROES MANAGEMENT PLAN.

STECF notes that ICES has evaluated the management plan and has found it to be consistent with the precautionary approach. However STECF notes inconsistencies between the SSB limits used - $B_{Trigger}$ is set at 2.2 million tonnes, while B_{pa} is 2.3 million tonnes.

Accordingly STECF notes that the rules for the above category imply the following options for TACs in 2010.

	2010 TAC	Basis
Category 4	Between 527 000 t and 572 000 t	Follow relevant management plan.

1.3. Hake (*Merluccius merluccius*) in Division Vb (1), VI and VII, and XII, XIV (Northern hake)

The management area covers Skagerrak, Kattegat, IIa, IIIb,c,d, IV, VI, VII, VIII, XII and XIV with separate TAC's for these Divisions.

FISHERIES: Hake is caught in nearly all fisheries in Subareas VII and VIII and also in some fisheries of Subareas IV and VI. The main part of the fishery (close to 80% of the total landings) was conducted in Subarea VII (Non-*Nephrops* trawling in medium to deep water, long-line in medium to deep water and gill nets in Sub-area VII), and in Sub-area VIII (gill nets in shallow to medium water and trawling in medium to deep water).

Landings were 47 800 t in 2008. The major fleets exploiting Northern hake have shown, in the longer term, a decrease in nominal fishing effort. Discards of juvenile hake can be substantial in some areas and fleets.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is ICES. The advice is based on an age-based assessment using commercial CPUE series and survey data. Discards were not included in the assessment. Some discard data were available but it was not possible to incorporate these in a consistent way.

MANAGEMENT AGREEMENT: There are explicit management objectives for this stock in the recovery plan (EC Reg. No 811/2004). The aim is to increase the SSB to above 140 000 t. An agreed fishing mortality of $F < 0.25$ with a year on year constraint on TAC of 15%, unless the stock is below 100 000. In this case a lower TAC will be applied.

PRECAUTIONARY REFERENCE POINTS: Precautionary reference points were updated in 2003 following a revision of the assessment model and data in the recent years. The basis for setting reference points remained unchanged. The proposed reference points are: B_{lim}: 100,000 t, B_{pa}: 140,000 t, F_{lim}: 0.35, F_{pa}: 0.25.

STOCK STATUS: Based on the most recent estimates of SSB (in 2009) and fishing mortality (in 2008) ICES classifies the stock as being at full reproductive capacity and being harvested sustainably. SSB is estimated to be just above B_{pa} in 2009, and F has been around F_{pa} since 2001. Recruitment has been relatively stable over the last decade.

RECENT MANAGEMENT ADVICE: ICES advises on the basis of the exploitation boundaries in relation to precautionary limits that landings for 2010 should not exceed 55 200 t.

Other considerations:

Exploitation boundaries in relation to existing management plans: A fishing mortality of $F = 0.25$ as indicated in Article 5.2 of the agreed recovery plan is expected to lead to an SSB of 171,200 t in 2011 (the highest SSB since 1989), with estimating landings in 2010 of 55 200 t. This implies an increase in TAC of 7%.

Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential and considering ecosystem effects: The fishing mortality in 2008, estimated at 0.24, is above fishing mortalities that are expected to lead to high long-term yields and low risk of stock depletion (F0.1 = 0.10 and Fmax = 0.18). This indicates that long-term yield is expected to increase at fishing mortalities well below the historic values. Fishing at such a lower mortality is expected to lead to higher SSB and therefore lower the risk of observing the stock to be outside precautionary limits.

STECF COMMENTS: STECF agrees with the ICES assessment of the state of the stock and agrees with the TAC advice for 2010. STECF notes that ICES is based on the precautionary approach and not on the agreed management plan. However, the ICES approach results in a fishing mortality in 2010 which is consistent with the maximum fishing mortality allowed by the management plan.

STECF also agrees with ICES that effective measures to reduce discarding are also needed, given the substantial discards of juvenile hake in some areas and fleets.

STECF further notes ICES' concerns over several sources of uncertainty in the assessment and forecast for this stock, mainly due to growth and discards estimation. This raises questions on the accuracy of ageing data and the calculation of historic catch-at-age data. STECF notes that if growth of hake is underestimated, the stock is likely to be smaller and fishing mortality higher and reference points would need to be revisited. There are also large uncertainties associated with the most recent recruitment estimates; these are only estimated by a single survey. In the absence of reliable 2007 and 2008 recruitment estimates, geometric mean recruitment has been used in the forecast. STECF agrees with ICES concerns and considers that special attention must be paid to improve the accuracy of age determination and discards estimation.

FISHING OPPORTUNITIES FOR 2010 ACCORDING TO THE AGREED MANAGEMENT PLAN (Council Regulation (EC) No 811/2004).

STECF notes that this plan has not been evaluated to be consistent with the precautionary approach. However, as the result of the recommended TAC according the precautionary reference points and the agreed hake recovery plan are identical, STECF therefore advices that the TAC for 2010 should be set at 55 2000 t.

1.4. Blue whiting (*Micromesistius poutassou* L.) in Sub -areas I-IX, XII and XIV

Blue whiting is widely distributed in the eastern North Atlantic extending from the Strait of Gibraltar to the Barents Sea. It consists of several populations with genetic "leakage" between them, but it is treated as one stock since it has so far not been possible to define an unambiguous border between populations.

FISHERIES: Blue whiting is exploited mainly by fleets from Norway, Russia, the Faroe Islands, and Iceland but the Netherlands, Scotland, Denmark, Ireland, Sweden, Germany and Spain also take substantial catches. The fishery for blue whiting was fully established in 1977. The Northern blue whiting stock is fished in Subareas II, V, VI, and VII and most of the catches are taken in the directed pelagic trawl fishery in the spawning and post-spawning areas (Divisions Vb, VIa,b and VIIb,c). Catches are also taken in the directed and mixed fishery in Subarea IV and Division IIIa, and in the pelagic trawl fishery in the Subareas I and II, in Divisions Va, and XIVa,b. The fisheries in the northern areas have taken 330,000 t to 640,000 t per year in the first half of the nineties, after which catches increased to close to 1,000,000 t in the latter part of the decade. Catches have been above 1,000,000 for most years after 2000 with 2003 and 2004 having recorded the highest catches (>2,200,000). In the southern areas (Subarea VIII, IX, Divisions VIId,e and g-k) catches have been stable in the range of 25,000 to 34,000 t between 1987 and 2006 with the exception of 2004 when 85,000 t were recorded. Catches in 2007 however, were at a historic low of 17,634 t. In Division IXa blue whiting is mainly taken as bycatch in mixed trawl fisheries.

Total landings over all areas in 2008 were 1.25 million t. Recent large landings were supported by high recruitments; however these have been steadily declining since 2001. The estimation of the last recruiting year-class2007 is the lowest on record with 3.9 million new recruits. Most of the catches are taken in the spawning and post-spawning areas along the continental edge, and in the Norwegian Sea. In the latter, the share of the total catch has increased from 5% in the mid-nineties to about 40% in 2003 and 2004. A larger proportion of the catch there consists of young fish. In 2005, the fishery in the Norwegian Sea was reduced to about half of the 2004 fishery. In 2002 to 2005, and in the absence of agreements on TACs and their allocation, the EU, Faroe

Islands, Iceland, Norway, and the Russian Federation implemented unilateral measures to limit blue whiting catches.

A new management plan was agreed by Norway, EU, The Faroe Islands and Iceland, and NEAFC in November 2008, replacing the one agreed in 2005.

1. *The Parties agree to implement a long term management plan for the fisheries on the Blue Whiting stock, which is consistent with the precautionary approach, aiming at ensuring harvest within safe biological limits and designed to provide for fisheries consistent with maximum sustainable yield, in accordance with advice from ICES.*

2. *For the purpose of this long term management plan, in the following text, "TAC" means the sum of the coastal State TAC and the NEAFC allowable catches.*

3. *As a priority, the long term plan shall ensure with high probability that the size of the stock is maintained above 1.5 million tonnes (B_{lim}).*

4. *The Parties shall aim to exploit the stock with a fishing mortality of 0.18 on relevant age groups as defined by ICES.*

5. *While fishing mortality exceeds that specified in paragraph 4 and 6, the Parties agree to establish the TAC consistent with reductions in fishing mortality of 35% each year until the fishing mortality established in paragraph 4 and 6 has been reached. This paragraph shall apply only during 2009 and 2010.*

For the purposes of this calculation, the fishing percentage mortality reduction should be calculated with respect to the year before the year in which the TAC is to be established. For this year, it shall be assumed that the relevant TAC constrains catches.

6. *When the fishing mortality in paragraph 4 has been reached, the Parties agree to establish the TAC in each year in accordance with the following rules:*

   • In the case that the spawning biomass is forecast to reach or exceed 2.25 million tonnes (SSB trigger level) on 1 January of the year for which the TAC is to be set, the TAC shall be fixed at the level consistent with the specified fishing mortality.
   • In the case that the spawning biomass is forecast to be less than 2.25 million tonnes on 1 January of the year for which the TAC is to be set (B), the TAC shall be fixed that is consistent with a fishing mortality given by:

$$F = 0.05 + [(B - 1.5)(0.18 - 0.05) / (2.25 - 1.5)]$$

   • In the case that spawning biomass is forecast to be less than 1.5 million tonnes on 1 January of the year for which the TAC is to be set, the TAC will be fixed that is consistent with a fishing mortality given by F = 0.05.

7. *When the fishing mortality rate on the stock is consistent with that established in paragraph 4 and the spawning stock size on 1 January of the year for which the TAC is to be set is forecast to exceed 2.25 million tonnes, the Parties agree to discuss the appropriateness of adopting constraints on TAC changes within the plan.*
8. *The Parties, on the basis of ICES advice, shall review this long term management plan at intervals not exceeding five years and when the condition specified in paragraph 4 is reached*

ICES has evaluated the agreed management plan and concluded that the agreement is consistent with the precautionary approach (the risk of falling below B_{lim} in the long term 10-20 years is less than 5 %).

SOURCE OF MANAGEMENT ADVICE: The main body for management advice is ICES. The assessment uses catch-at-age data from commercial catches from 1981–2008 and three acoustic surveys (Norwegian

spawning ground survey 1993–2003, international ecosystem survey in the Nordic Seas 2000–2009, and the international blue whiting spawning ground survey 2003–2009). The international blue whiting spawning ground survey is the only survey that covers almost the entire distribution area of the spawning stock. The same assessment model has been used during the last four years. However, in this year's assessment, the results from the spawning ground survey were accorded greater statistical weight than in previous assessments because the survey time series is now longer than when the survey was initially included in the stock assessment (2007).

PRECAUTIONARY REFERENCE POINTS: The precautionary reference points for fishing mortality and biomass are $\mathbf{F}_{pa}$ =0.32, F_{lim} = 0.53, $\mathbf{B}_{pa}$ =2.25 million t, B_{lim}= 1.5 million t

STOCK STATUS: Based on the most recent estimates of SSB (in 2009) and, fishing mortality (in 2008), ICES classifies the stock as having full reproductive capacity and being harvested sustainably (F=0.29). Year classes 2005-2008 are among the lowest observed. Due to recent low recruitment, SSB has declined from its historical peak in 2003-2004 of more than 7 million tonnes to 3.6 million tonnes at the beginning of 2009, and the decline is expected to continue in the short-term.

Recent work on stock identification of blue whiting based on genetics and growth rates suggests that there is likely to be more than a single stock in the Northeast Atlantic. While more work is required to confirm the stock composition, blue whiting populations in areas VIIk and VIIj and further south likely form a separate unit from all other Northeast populations.

RECENT MANAGEMENT ADVICE: Following the agreed management plan implies landings of 540 000 tonnes in 2010 which is expected to lead to a decline in the SSB of 14% by 2011.
The agreed management plan is considered to be in accordance with the precautionary approach.

STECF COMMENTS: STECF agrees with ICES.

STECF encourages studies to determine the stock composition of blue whiting in the North-East Atlantic.

FISHING OPPORTUNITIES FOR 2010 ACCORDING TO THE AGREED NORWAY, EU, THE FAROE ISLANDS. ICELAND, AND NEAFC MANAGEMENT PLAN.

STECF notes that this plan has been evaluated to be consistent with the precautionary approach.

Accordingly STECF notes that the rules for the above category imply the following options for TACs in 2010.

	2010 TAC	Basis
Category 4	540,000 t	Follow relevant management plan.

1.4.1. Blue whiting (*Micromesistius poutassou* L.) in Sub -areas IIa(1)-North Sea (1)

Blue Whiting in these sub-areas is assessed together with all other areas as a single stock. See section 1.4.

1.4.2. Blue whiting (*Micromesistius poutassou* L.) in Sub -areas Vb(1),VI,VII

Blue Whiting in these sub-areas is assessed together with all other areas as a single stock. See section 1.4.

1.4.3. Blue whiting (*Micromesistius poutassou* L.) in Sub -areas VIIIabd

Blue Whiting in these sub-areas is assessed together with all other areas as a single stock. See section 1.4.

1.4.4. Blue whiting (*Micromesistius poutassou* L.) in Sub -areas VIIIe

Blue Whiting in these sub-areas is assessed together with all other areas as a single stock. See section 1.4.

1.4.5. Blue whiting (*Micromesistius poutassou* L.) in Sub -areas VIIIc,IX,X

Blue Whiting in these sub-areas is assessed together with all other areas as a single stock. See section 1.4.

1.5. Herring (*Clupea harengus*) in Div. I and II. (Norwegian Spring Spawners)

FISHERIES: The total catches in 2008 were 1.55 million t., mainly taken by Norway (961 000 t), Russia (193 000 t), Iceland (217 000 t), EU (95 000 t), and Faroe Islands 74 000 t). The fishery in general follows the migration of the stock closely as it moves from the wintering and spawning grounds along the Norwegian coast to the summer feeding grounds in the Faroese, Icelandic, Jan Mayen, Svalbard, and international areas. Due to limitations for some countries to enter the EEZs of other countries in 2008, the fisheries do not necessarily depict the distribution of herring in the Norwegian Sea. A special feature of the summer fishery in 2005 and 2006 was the prolonged fishery in the Faroese and Icelandic zone. In 2007 and 2008 a clean herring fishery was hampered by mixture of mackerel schools in the area. This was especially the case for the Faroese fleet, which usually targets mackerel later in the year (October–November).

A large increase in fishing effort, new technology, and environmental changes contributed to the collapse of this stock around 1970. Recruitment failed in the second half of the 1960s when the SSB was reduced below 2.5 million t. Starting in 1989, a succession of above-average to very strong year-classes were produced, promoting full recovery of the SSB and allowing an expansion of the fishery. Management regulations have restricted landings in recent years.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is ICES. The advice is based on an analytical assessment, which takes into consideration catch data and eight surveys (acoustic surveys of adults and juveniles, larval survey, and 0-group survey). ICES investigated the use of a number of different models. When appropriately formulated, they all gave a similar perception of the trajectory for stock size and fishing mortalities. On this basis, the TASACS model was used. The present assessment is an updated assessment, using the models, configurations and procedures agreed at the benchmark assessment in 2008.

PRECAUTIONARY REFERENCE POINTS: The proposed precautionary reference points for biomass and fishing mortality are $\mathbf{B}_{pa}$ = 5 million t, B_{lim} =2.5 million t. $\mathbf{F}_{pa}$ = 0.15. F_{lim} is not defined.

STOCK STATUS: Based on the most recent estimates of SSB (in 2009) ICES classifies the stock as having full reproductive capacity. Based on the most recent estimate of fishing mortality (in 2008) ICES classifies the stock as being harvested sustainably.

SSB in 2009 is well above B_{pa} and is estimated as one of the highest in the time-series. The stock contains a number of good year classes. In the last 10 years, four large year classes have been produced (1998, 1999, 2002 and 2004). However, the available information indicates that year classes after 2004 have been of low abundance.

RECENT MANAGEMENT ADVICE: In 1999 EU, Iceland, Faroe Islands, Norway and Russia agreed on a long-term management plan from 2001. The aim is to maintain the stock size above 2.5 million t and to maintain a fishing mortality rate of 0.125. Should SSB fall to below 5 million t ($\mathbf{B}_{pa}$) the fishing mortality rate shall be adapted to ensure a rapid recovery of SSB to the $\mathbf{B}_{pa}$ level. This plan is considered by ICES to be precautionary and with targets consistent with high long-term yield and low risk of depletion production potential. The management plan implies maximum catches of 1 483 000 t in 2010, which is expected to leave a spawning stock of 10.8 million t in 2011.

In June 2009, an agreement was concluded between contracting parties to the Coastal States on mackerel banning highgrading, discarding, and slipping from pelagic fisheries targeting mackerel, horse mackerel, and herring beginning in January 2010.

STECF COMMENTS: STECF agrees with the advice from ICES.

FISHING OPPORTUNITIES FOR 2010 ACCORDING TO THE AGREED EU, ICELAND, FAROE ISLANDS, NORWAY AND RUSSIA MANAGEMENT PLAN.

STECF notes that this plan has been evaluated to be consistent with the precautionary approach.

Accordingly STECF notes that the rules for the above category imply the following options for TACs in 2010.

	2010 TAC	Basis
Category 4	1 483 000 t	Follow relevant management plan.

1.6. Capelin (*Mallotus villosus*) in Sub-areas I and II, excluding IIa west of 50W.

FISHERIES: Norway and Russia are the two main countries which exploit the capelin stocks in these areas. No fishery took place between autumn 1993 and spring 1999. The fishery was re-opened in the winter of 1999. Since 1979 the fishery has been regulated by a bilateral agreement between Norway and Russia (formerly USSR) and since 1987, catches have been very close to the advice, varying between 100,000 t and 650,000 t. The fishery was closed from 2004-2008.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is ICES. The assessment and stock history is based on joint Russia-Norwegian acoustic surveys during September each year. A model incorporating predation from cod has been used for predicting SSB and for estimating the historical time series of SSB (Report from the 2009 joint Russian-Norwegian meeting to assess the Barents Sea capelin stock, Kirkenes, October 3-4 2009.
Report of the Arctic Fisheries Working Group, 21-27 April 2009. ICES CM 2009/ACOM:02.).

PRECAUTIONARY REFERENCE POINTS: The proposed limit reference point for biomass is B_{lim} = 200,000 t. No precautionary fishing mortality or biomass reference points have been proposed.

STOCK STATUS: Based on the most recent estimates of SSB and recruitment, ICES classifies the stock as having full reproductive capacity. The maturing component in autumn 2009 was estimated to be 2.3 million tonnes. The spawning stock in 2010 will consist of fish from the 2006 and 2007 year-classes, but the 2006 year-class will dominate. The survey estimate at age 1 of the 2008 year-class is below the long-term average, while 0-group observations during the joint Russian-Norwegian ecosystem survey in August-September 2009 indicated that the 2009 year-class is strong.

MANAGEMENT OBJECTIVES: The fishery is managed according to a target escapement strategy, with a harvest control rule allowing (with 95% probability) the SSB to be above the proposed B_{lim}, taking predation by cod into account. ICES considers the management plans to be consistent with the precautionary approach. The harvest control rule presupposes that all catch is taken during January-April, prior to spawning

RECENT MANAGEMENT ADVICE:

Exploitation boundaries in relation to existing management plans: Following the international agreement between Norway and Russia would imply catches of 360 000 tonnes in spring 2010. Only catches of mature fish have been considered.

STECF COMMENTS: STECF agrees with the ICES advice.

FISHING OPPORTUNITIES FOR 2010 ACCORDING TO THE AGREED NORWAY AND RUSSIA HARVEST CONTROL RULE.

STECF notes that this international agreement has been evaluated to be consistent with the precautionary approach.

Accordingly STECF notes that the rules for the above category imply the following options for TACs in 2010.

	2010 TAC	Basis
Category 4	360,000 t	Follow relevant management plan.

1.7. Northern shrimp (*Pandalus borealis*) on Fladen Ground (Division IVa)

FISHERIES: In the EU zone of the North Sea, *Pandalus* on the Fladen Ground (Div. IVa) is the main shrimp stock exploited, which has been exploited. This stock has been exploited mainly by Danish and UK trawlers with the majority of landings taken by the Danish fleet. Historically, large fluctuations in this fishery have been frequent, for instance between 1990 and 2000 annual landings ranged between 500 t and 6000 t. However since 2000 a continuous declining trend is evident, and in 2004 and 2005 recorded landings dropped to below 25 t. No catches were recorded in 2006-2008. Information from the fishing industry in 2004 gives the explanation that this decline is caused by low shrimp abundance, low prices on small shrimp characteristic for the Fladen Ground and high fuel prices.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is ICES. No assessment of this stock has been made since 1992, due to insufficient assessment data.

PRECAUTIONARY REFERENCE POINTS: There is no basis for defining precautionary reference points for this stock.

STOCK STATUS: There is a total lack of separate, fishery independent data. The most recent analytical assessment of this stock was presented in the 1992 ACFM Report (ICES, 1992). Landings have declined since 2000, and since 2006 no catches have been recorded. Part of the explanation for this development is the low price for shrimp combined with the rather high fuel costs. No monitoring of this stock has taken place, and recent years' drop in landings is at least partly due to a decline demand for these shrimp. However, it cannot be ruled out that the drop also reflects a decline in the stock.

RECENT MANAGEMENT ADVICE: No stock-specific management advice for 2010 is given by ICES. In the absence of information on stock development, ICES recommends that when/if the fishery on this stock begins, the effort should not increase to levels above the average for the years prior to the present absence of fishing activities and that the fishery must be accompanied by mandatory programmes to collect catch and effort data on both target and by-catch fish.

STECF COMMENTS: STECF agrees with the ICES recommendation

FISHING OPPORTUNITIES FOR 2010 ACCORDING TO ANNEX II OF COM (2009) 224

STECF notes that in order to to comply with the objectives of the precautionary approach as interpreted by ICES, then in accordance with the Commissions Communication on Fishing opportunities for 2010 (COM (2009) 224), Northern shrimp (Pandalus borealis) on Fladen Ground (Division IVa) should be classified as a category 11 stock.

Accordingly STECF notes that the rules for the above category imply the following options for TACs in 2010.

	2010 TAC	Basis
Category 11	NE*	No Advice, TAC based on recent catch levels.

***NE- not estimable** – It is noticed that, **if fisheries on this stock is resumed**, ICES recommends that effort should not be allowed to expand to levels above the average for the years prior to the present absence of fishing activities (1999-2003), corresponding to average landings of 1400 t.

1.8. Northern shrimp (*Pandalus borealis*) in Division IIIa and Division IVa East (Skagerrak and Norwegian Deeps)

FISHERIES: *Pandalus borealis* is fished by bottom trawls at 150–400 m depth throughout the year by Danish, Norwegian and Swedish fleets. Total landings have varied between 10,000 and 15,000 t in the period 1985-2008. Discarding of small shrimp takes place, mainly due to high grading. In 2008 total landings were around 13000 t, while estimated catches (including discards) were around 16,400 t.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is ICES. In recent years several assessment models, including both cohort based and stock production models, have been applied for this stock. A major problem has been (and still is) to obtain realistic data for the predation mortality on this stock, which is believed to have stronger influence on the stock fluctuations than the fishery.

PRECAUTIONARY REFERENCE POINTS: Limit reference points have not been defined for this stock.

STOCK STATUS: As no reference points are defined, the state of the stock cannot be evaluated with regard to biological reference points, and the state of the stock is uncertain. The LPUE indices indicate that the stock has been fluctuating without any clear trends since the mid-1990s. However, abundance indices from Norwegian survey indicate a decrease since 2007 and recruitment indices (as 1 year old) from the Norwegian survey indicate a decrease since 2007, which may imply a further decline in biomass in 2010.

RECENT MANAGEMENT ADVICE: ICES advises on the basis of exploitation boundaries in relation to precautionary considerations that the total landings from IIIa and IVa East in 2010 should not be increased above the 2008 level of 13 000 t (corresponding to an estimated catch level of 15000-16000 t).

STECF COMMENTS: STECF agrees with ICES that the state of the stock is uncertain and that survey indices indicate decline in both recruitment and stock biomass in recent years. However, considering fluctuations since 1990s, both in recruitment and stock size the magnitude of recent years downward trends do not exceed up- and down-fluctuation in earlier years. In relation to precautionary considerations STECF also agrees with ICES in that the management of this stock should address the discarding of small shrimps, which occurs mainly due to high-grading as a consequence of restrictive TACs. Furthermore, STECF endorses that sorting grids facilitating the escape of fish should be mandatory in this fishery as they are in all other *Pandalus borealis* fisheries in the North Atlantic.

FISHING OPPORTUNITIES FOR 2010 ACCORDING TO ANNEX II OF COM (2009) 224
STECF notes that in order to comply with the objectives of the precautionary approach as interpreted by ICES, then in accordance with the Commissions Communication on Fishing opportunities for 2010 (COM (2009) 224), Northern shrimp (Pandalus borealis) Division IIIa (West) and Division IVa East, should be classified as a category 6 stock.

Accordingly STECF notes that the rules for the above category imply the following options for TACs in 2010.

	2010 TAC *	Basis
Category 6	14110 t	Catch advice based on rule 5b in Annex III. It is, however, noticed that the data series is insufficient for correct application of this rule.

* - No TAC set for Pandalus Borealis in this area

1.9. Norway pout (*Trisopterus esmarki*) in IIa, IIIa and the North Sea

FISHERIES: The fishery is mainly by Danish and Norwegian vessels using small mesh trawls in the northern North Sea.

The stock is managed by TACs. Landings fluctuated between 110,000 and 735,000 t. in the period 1971-1997, and apart from 2000 (184,000 t) decreased substantially in the following years The fishery was closed in 2005, reopened in 2006 and closed again in 2007. The agreed TAC for 2008 was 43,500 t. Landings in 2008 were 36,100 t.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is ICES. The analytical seasonal XSA assessment model fitted for this stock is based on time-series of catch-at-age, one commercial cpue series, and four research survey series.

MANAGEMENT OBJECTIVES: No management objectives have been set for this stock. Due to the short-lived nature of this species a preliminary TAC is set every year, which is updated on the basis of advice in the first half of the year.

ICES has evaluated and commented on three management strategies, following requests from managers – fixed fishing mortality (0.35), fixed TAC (50 000 t), and a variable TAC escapement strategy. The evaluation shows that all three management strategies are capable of generating stock trends that stay away from Blim with a high probability in the long-term and are therefore considered to be in accordance with the precautionary approach.

PRECAUTIONARY REFERENCE POINTS: No F_{pa} is set for this stock. The proposed B_{pa} = 150,000t, B_{lim} = 90,000.

STOCK STATUS: The most recent estimates of SSB (Q3 2009) show full reproductive capacity of the stock (SSB>Bpa). Catches and fishing mortality has been low in 2008 and first half year 2009. Fishing mortality has generally been lower than the natural mortality for this stock and has decreased in recent years well below the long term average F (0.6). Recruitment in 2008 was just below the long term average and in 2009 was above average.

RECENT MANAGEMENT ADVICE:

ICES advises on the basis of precautionary limits that in order to maintain the spawning stock biomass above B_{pa} in 2010 catches should be restricted to less than 307,000 t.

Other considerations:

The catch forecast for 2010 assumes status quo fisheries in 2009, with catches of 45 000 t. This is well below the quota for 2009 (157 000 t). In case the quota are fully taken in 2009 this will result in lower catch forecasts for 2010 (226 000 t to reach Bpa by 2011).

STECF COMMENTS: STECF agrees with the advice from ICES and the additional considerations.

FISHING OPPORTUNITIES FOR 2010 ACCORDING TO ANNEX II OF COM (2009) 224

With the background of the latest scientific assessments and advice and with reference to the Communication from the Commission (COM (2009) 224) on a consultation on fishing opportunities for 2010, STECF notes that Norway pout in Subarea IV should be classified as a category 5 stock.

Accordingly STECF notes that the rules for each of the above category imply the following options for TACs in 2010.

	2010 TAC	Basis
Category 5	307 000 t*	Short-lived species

* assuming a catch of 45 000t in 2009

1.10. Sandeel (*Ammodytidae*) in the Skagerrak and the Kattegat (IIIa)

ICES provides only landings information for Sandeels in this sub-area. The TAC is set for the whole of the North Sea and Kattegat (VI, IIIa), so that the advice and TAC are provided in section 1.13

1.11. Sandeel (*Ammodytidae*) in the North Sea (IV) excluding the Shetland area

Sandeel in the North Sea, the Skagerrak and the Kattegat includes five species. *Ammodytes marinus* is dominating in the North Sea while *Ammodytes tobianus* is relatively more abundant in the Skagerrak and the Kattegat. ICES therefore assess sandeel in the area as three separate stocks, two for the North Sea (Shetland and North Sea excluding the Shetlands) and one for the Skagerrak and the Kattegat. No analytical assessment is available for sandeel in the Skagerrak and the Kattegat.

FISHERIES: Sandeel is taken by trawl with codend mesh sizes of less than 16 mm. The fishery is seasonal, taking place from April to July. Most of the catch in the North Sea consists of *Ammodytes marinus* while *Ammodytes tobianus* constitute a substantial part of the catches in the Skagerrak and the Kattegat. By-catch of other species is low. Sandeels are largely stationary after settlement and the sandeel must be cnsidered as a complex of local populations.

The stocks are exploited predominantly by Denmark and Norway, with minor landings taken by the UK, Sweden, Germany and the Faroes. Landings fluctuated between 550,000 and 1,140,000 t in the period 1980 to 2002 with the highest catches observed in 1997. Catches dropped in 2003 and have since then been well below average reaching a minimum of 172,000 t in 2005. Catches in 2008 amount to 335,200 t. Catch possibilities are largely dependent on the size of the recruiting year-class.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is ICES. The advice is based on a seasonal age-based assessment using commercial CPUE data.

PRECAUTIONARY REFERENCE POINTS: The proposed precautionary biomass reference point for the North Sea stock is Bpa = 600,000t. No precautionary fishing mortality reference point has been proposed.

STOCK STATUS: According to the most recent estimate of SSB (2009), ICES classifies the stock as being at risk of reduced reproductive capacity. Fishing mortality decreased between 2001 and 2007 and increased in 2008 and 2009, but the present absolute level is uncertain. In the absence of an F reference point, the state of the stock cannot be evaluated with regard to sustainable harvest.

RECENT MANAGEMENT ADVICE:

ICES advises on the basis of exploitation boundaries in relation to precautionary limits that fishing grounds that are known to be commercially depleted should be closed to fishing while at non-depleted fishing grounds fishing should only be allowed in 2010 if analysis of real-time monitoring indicates that the stock can be rebuilt to Bpa by 2011

ICES recommends that fishing grounds that are known to be commercially depleted should be closed to fishing until there is evidence from monitoring programs that local populations have recovered. On other fishing grounds, a fishery should only be allowed in 2010 if analysis of monitoring indicates that the stock can be rebuilt to Bpa by 2011.

Other considerations:

Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential, and considering ecosystem effects: ICES recommended that the management of sandeel fisheries should implement measures to prevent depletion of local aggregations, particularly in areas where predators congregate.

STECF COMMENTS: STECF agrees with ICES advice.

Fishing possibilities are highly dependent on the size of the incoming year-class for which no reliable estimate exists prior to the start of the fishing season. Since 2005, the fisheries have been managed by a precautionary fishing effort ceiling covering a monitoring fishery in the first part of the fishing season, and a final TAC has been set on the basis of the results of the real time monitoring fishery and an agreed harvest rule.

STECF therefore advises that the procedure used by ICES should be applied in 2010 using the revised relationship provided by ICES as follows:

$$TAC_{2010} = -333 + R_{1,2010} * 3.692$$

where $R_{1,2010}$ is the stock size of age-1 sandeel in billions on 1 January 2010 and the TAC is in 1000 tonnes. The estimate $R_{1,2010}$ is derived from the Cpue(age 1) obtained in the RTM fishery.

STECF notes that the above relationship proposed by ICES only applies to the North Sea sandeel excluding the Shetlands, but that the TAC management area includes the whole of the North Sea and Skagerrak and Kattegat as well. Hence, the likely catches of sandeel in the other areas should be taken into account in deriving a TAC for the whole management area. No information is presently available to allow STECF to predict the likely catches in the other areas in 2010. Landings from IIIa and the Shetlands have over the last 20 years constituted 4.43 % of the North Sea landings. STECF suggests that a pragmatic approach would be to use the same percentage to raise the TAC for the North Sea excluding the Shetlands to a TAC for IV and IIIa combined.

FISHING OPPORTUNITIES FOR 2010 ACCORDING TO ANNEX II OF COM (2009) 224

With the background of the latest scientific assessments and advice and with reference to the Communication from the Commission (COM (2009) 224) on a consultation on fishing opportunities for 2010, STECF notes that sandeels in Subarea IV and IIIa should be classified as a category 5 stock.

Accordingly STECF notes that the rules for each of the above category imply the following options for TACs in 2010.

	2010 TAC	Basis
Category 5	0 t*	Short-lived species

*unless the real-time monitoring in 2010 can show the population is able to reach Bpa in the presence of fishing.

1.12. Sandeel in Division IVa North of 59ºN and West of 0ºE (Shetland area)

ICES provides only landings information for Sandeels in this sub-area. The TAC is set for the whole of the North Sea and Kattegat (VI, IIIa), so that the advice and TAC are provided in section 1.13

1.13. Sprat (*Sprattus sprattus*) in ICES Division IIIa

FISHERIES: The fisheries in IIIa are carried out by Denmark and Sweden using trawlers and along the Swedish coast by small purse seiners. Landings of sprat in Division IIIa averaged about 70,000 t in the 1970s, but since 1982 have typically been around 20,000 t, with the exception of 1994–1995 when the ACFM catches were 96,000 t and 56,000 t respectively. Landings in the last ten years have been below 30,000 t, except for 2005 when 40,000 t were reported.Caches have declined since then. ICES estimates the catch in 2008 to be 9,000 t, The directed human consumption sprat fishery serves a very small market while most sprat catches are taken in an industrial fishery, where catches are limited by herring by-catch restrictions. This combination of factors has prevented full utilisation of the occasional strong year-classes (which, in general, emerge and disappear very quickly).

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is ICES.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for sprat in Division IIIa.

STOCK STATUS: The available information is inadequate to evaluate stock trends and therefore the state of the stock is unknown. Sprat in this area is short-lived with large annual natural fluctuations in stock biomass.

MANAGEMENT OBJECTIVES: There are no explicit management objectives for this stock. ICES considers that sprat cannot be fished without by-catches of herring except in years with high sprat abundance or low herring recruitment. As sprat in Division IIIa is mainly fished together with juvenile herring, the exploitation of sprat is limited by the restrictions imposed on fisheries for juvenile herring.

RECENT MANAGEMENT ADVICE:

The advice on this stock for the fishery in 2010 is therefore the same as the advice given in 2008 for the 2009 fishery: “Sprat in Division IIIa is mainly fished together with juvenile herring and the exploitation of sprat is limited by the restrictions imposed on fisheries for juvenile herring”

STECF COMMEMTS: STECF agrees with the ICES advice.

FISHING OPPORTUNITIES FOR 2010 ACCORDING TO ANNEX II OF COM (2009) 224

With the background of the latest scientific assessments and advice and with reference to the Communication from the Commission (COM (2009) 224) on a consultation on fishing opportunities for 2010, STECF notes that sprat in Division IIIa should be classified as a category 5 stock.

STECF notes that an ICES workshop on shortlived species (WKSHORT) took place in September 2009, but the results are not yet available.

1.14. Sprat (Sprattus sprattus) in the North Sea (Subarea IV)

FISHERIES: Denmark, Norway and UK exploit the sprat in this area. The fishery is carried out using trawlers and purse seiners. There are considerable fluctuations in total landings, from a peak in 1975 of 641,000 t to a low in 1986 of around 20,000 t. Since 1994, landings have varied from a high, in 1994, of 320,000t to a low, in 1997, of 103,400t. In the last 10 years landings have been below 200,000 t. Estimated total landings in 2007 and 2008 were around 83,800 t, and 61,000 t respectively, the lowest values in the entire time series.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is ICES. The assessment is based on indicators derived from a research survey and on a two-stage Catch-Survey Analysis (CSA). The CSA model assumes that the population consists of two stages: the recruits and the fully recruited ages. Uncertainties in both the assessment method and the survey indices make the current understanding of this stock extremely poor. Detailed study of improved or alternative assessment methods (e.g. length-based assessment) and the use of additional information sources (e.g. acoustic surveys, catch per unit effort) are required in order improve our level of understanding and ability to adequately manage this stock.

MANAGEMENT OBJECTIVES: There are no explicit management objectives for this stock

PRECAUTIONARY REFERENCE POINTS: No reference points have been defined for this stock.

STOCK STATUS: The state of the stock is uncertain. Survey trends indicate the stock size has increased from the 1980s and varied around an average level since 1998 with no trend.

RECENT MANAGEMENT ADVICE:

ICES notes that there is no evidence recent catches have created problems for the stock. There is no basis for specific numerical advice for the TAC in 2009.

The sprat stock in the North Sea is dominated by young fish. The stock size is mostly driven by the recruiting year-class. Thus, the fishery in a given year will be dependent on that year's incoming year. In the forecast table for North Sea herring, industrial fisheries are allocated a by-catch of approx 10 000 t of juvenile herring in 2010. It is important to continue monitoring of by-catch of juvenile herring to ensure compliance with this allocation. Catches in recent years have been well below the advised and agreed TAC and have decreased because of economic and other reasons.

STECF COMMENTS: Noting that because of the current recruitment problems for North Sea herring, STECF **recommends** that the by-catch quota for herring taken in fisheries conducted with fishing gears with mesh sizes below 32 mm in the North Sea should be significantly reduced.

FISHING OPPORTUNITIES FOR 2010 ACCORDING TO ANNEX II OF COM (2009) 224

With the background of the latest scientific assessments and advice and with reference to the Communication from the Commission (COM (2009) 224) on a consultation on fishing opportunities for 2010, STECF notes that sprat in the North Sea should be classified as a category 5 stock.

STECF notes that an ICES benchmark assessment for North Sea sprat took place in September 2009 (WKSHORT), but the results are not yet available.

1.15. Horse mackerel (*Trachurus trachurus*) in ICES division IXa

FISHERY: Catches decreased from the early 1960s but have been relatively stable since the early 1990s at 20,000t – 25,000 t. The fleets fishing for horse mackerel are also fishing for other species (e.g. sardine) and changes in the availability of those other species could affect the targeting on horse mackerel.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is ICES.

PRECAUTIONARY REFERENCE POINTS: No reference points have been proposed for this stock.

STOCK STATUS: In the absence of defined reference points, the state of this stock cannot be evaluated with regard to these. Catches decreased from the early 1960s but have been relatively stable since the early 1990s. Based on the age composition of catches, the assessment conducted in 2008 and the exploratory assessment conducted in 2009, the recent level of catches do not seem to have been detrimental for the stock

RECENT MANAGEMENT ADVICE: ICES advises that catches in 2010 should not exceed 25 000 t. There are no explicit management objectives for this stock.

Other considerations:
The migratory pattern of southern horse mackerel shows that age classes are not evenly distributed over the area inhabited by the stock. Most of the older fish are present in the waters off Galicia and northern Portugal. An increased fishing effort in those areas could lead to a decline in the spawning stock.

STECF COMMENTS: STECF agrees with the advice from ICES.

FISHING OPPORTUNITIES FOR 2010 ACCORDING TO ANNEX II OF COM(2009) 224

With the background of the latest scientific assessments and advice and with reference to the Communication from the Commission COM(2009) 224 on a consultation on fishing opportunities for 2010, STECF notes that Horse Mackerel in Division IXa can be classified under Category 6.

Accordingly STECF notes that the rule for the above category implies the following option for TACs in 2010.

Category 6 State of the stock is not known; advice on appropriate catch

	2010 TAC	Basis
Category 6	57, 750 t	State of the stock is unknown, Annex III, Rule 4 (abundance information is not available), therefore an unchanged TAC.

1.16. Norway pout (*Trisopterus esmarki*) in Division VIa (West of Scotland)

FISHERIES: Total landings are available for this stock for the years 1987 – 2008. Landings during this period have varied considerable, from a high in 1987 of some 38,000 tonnes to less than 50 tonnes every year since 2005. Historically the majority of landings have been taken by Danish fleets with lesser catches by UK, Netherlands and Germany.

There are currently no dedicated fisheries for Norway Pout in Division VIa (West of Scotland).

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is ICES. **PRECAUTIONARY REFERENCE POINTS:** No fishing mortality or biomass reference points are defined for this stock.

STOCK STATUS: The available information is inadequate to evaluate the state of the stock.

RECENT MANAGEMENT ADVICE: The only data available are official landings statistics which have been highly variable and do not provide an adequate basis for scientific advice.

STECF COMMENTS: STECF notes that there are currently no dedicated fisheries for Norway Pout in Division VIa (West of Scotland).

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With the background of the latest scientific assessments and advice and with reference to the Communication from the Commission COM (2009) 224 on a consultation on fishing opportunities for 2010, STECF notes that Norway pout in division VIa can be classified under Category 11.

Accordingly STECF notes that the rule for the above category implies the following option for TACs in 2010.

	2010 TAC	Basis
Category 11	NE*	No advice

*NE - Not estimable

1.17. Sandeel (*Ammodytes spp. & Gymnammodytes spp.*) in Division VIa

FISHERIES: In the past the stocks were exploited exclusively by Scottish vessels. Recorded landings were between 15,000 t and 25,000 t from 1987 to 1990. Landings of between 5,000 t and 13,000 t were taken between 1991 and 2000 (except for 2,600 t in 1999). From 2001 landings fell sharply. The last recorded landings by Scotland were in 2004. Recorded landings have been zero in 2003, 2005, 2006 and 2008. In 2007 57 t were reported landed by the Faroe Islands, the first time this country has reported landings of sandeel from VIa.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is ICES. The only recent data available, however, are official landings statistics which have been highly variable and do not provide an adequate basis for scientific advice. The stock was last assessed in 1996.

PRECAUTIONARY REFERENCE POINTS: none.

STOCK STATUS: The available information is inadequate to evaluate stock trends relative to risk, so the state of the stock is unknown.

RECENT MANAGEMENT ADVICE: none.

STECF COMMENTS: STECF notes that work to better understand potential trends in natural mortality on cod in division VIa by modelling seal predation has been hampered because the level and trend in sandeel biomass available to the seal population west of Scotland is not known. As such, a lack of knowledge about this stock is potentially adversely affecting assessment of stocks of high commercial importance in the area.

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There is no TAC set for sandeel in that area.

1.18. Other revisions to advice given in June/July 2009

1.18.1. Norway lobster (Nephrops norvegicus) in FU 15, Irish Sea West (Division VIIa)

FISHERIES: Prior to 2007 landings from this FU are believed to be underreported. However, new legislation in 2007 increased the reliability of the landings data. Estimates of landings in 2007 were 8461 t from the Irish Sea West. Most of the landings are taken by the UK and the Republic of Ireland. The *Nephrops* trawl fisheries take by-catches of other species such as cod and particularly juvenile whiting. 2008 landings from this FU were more than 10500 t, an increase of 25% compared to 2007 landings.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is ICES. The assessment is based UWTV surveys of absolute abundance. At the ICES Benchmark Workshop on *Nephrops* in 2009 the major sources of bias associated to UWTV survey estimates of absolute abundance were quantified and an overall bias correction factor derived.

PRECAUTIONARY REFERENCE POINTS: No biological reference points have been determined for this stock of *Nephrop*, Instead, as mentioned in the introduction, F_{MAX} and $F_{0.1}$ are used as reference points

Reference points

F reference point	***Harvest Ratio***
$F_{0.1}$	12.2%
F_{MAX}	20.4%

STOCK STATUS: The stock is overfished. UWTV survey abundance estimates declined by 38 % between 2004 and 2008. 2008 catch rates from trawl surveys are close to the long-term mean of the series. Sex ratio and mean size from commercial catches and surveys remain stable. However, F(2008) is above F_{MAX}.

RECENT MANAGEMENT ADVICE: ICES advises on the basis of exploitation boundaries in relation to high long-term yield and low risk of depletion of production potential that the Harvest Rate for *Nephrops* fisheries should not exceed $F_{0.1}$. This corresponds to landings of no more than 5 892 t for the western Irish Sea stock.

STECF COMMENTS: STECF agrees with the ICES advice. STECF notes that landings by some fleets prior to 2007 are thought to have been underreported. The implementation of the Buyers and Sellers legislation in the UK in 2006 and "sales notes" in Ireland in 2007, coupled with the increased TAC in 2007, is thought to have improved the reliability of reported landings data. STECF notes that the advised landings for 2010 imply a reduction of 44% relative to the 2008 landings (10 500t). STECF further agrees with the ICES approach of a stepwise approach could be considered in this case. To move toward a fishing mortality corresponding to MSY in steps, a reduction of the catch corresponding to F_{MAX} could be considered as an intermediate step toward $F_{0.1}$ (as a proxy for F_{msy}). Alternatively, a constraint on the year-to-year change in catches as is typical of management plans might be considered

FISHING OPPORTUNITIES FOR 2010 ACCORDING TO ANNEX II OF COM (2009) 224

With the background of the latest scientific assessments and advice and with reference to the Communication from the Commission (COM (2009) 224) on a consultation on fishing opportunities for 2010, STECF notes that the *Nephrops* in Irish Sea West (FU 15) can be classified under Category 6.

Accordingly STECF notes that the rules for each of the above categories imply the following options for TACs in 2010.

	2010 TAC	Basis
Category 6	NE**	State of stock not known precisely.

**NE – Not estimable

STECF notes that the advised catch for 2010 should not exceed 5 892 t

1.18.2. Norway lobster (Nephrops norvegicus) in FU17, Aran Grounds (Division VIIb)

FISHERIES: Reported landings from this FU were around 1000 t in 2007 and 2008. In the Aran Grounds the most recent change in the fishery is the proportion of twin-rig vessels, which has increased to over 90 % of the fleet in the past eight years. This implies a large increase in effective effort, even if such an increase is not observed in the nominal effort figures.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is ICES. The assessment is based on an UWTV surveys. However, the corresponding length composition data are insufficient to base estimates of stock specific F reference point on. The use of reference points from other, similar stocks increases the uncertainties.

PRECAUTIONARY REFERENCE POINTS: There are no precautionary reference points for this FU. $F_{0.1}$ for similar stocks ranges between 8% and 12%. F_{MAX} for similar stocks ranges between 13% and 20%

STOCK STATUS: The UWTV survey conducted since 2002 estimates abundance to have fluctuated widely with a peak in 2004. The 2008 survey is the lowest in the series and the 2009 abundance is 51% of the abundance of the maxmum observed in 2004. Based on estimates of $F_{0.1}$ and F_{MAX} from other *Nephrops* stocks this stock may be overfished.

RECENT MANAGEMENT ADVICE: ICES advises on the basis of exploitation boundaries in relation to high long-term yield and low risk of depletion of production potential that the Harvest Ratio for *Nephrops* fisheries should be less than the lower bound of $F_{0.1}$ ranges for similar stocks (8%). This corresponds to landings of no more than 704 t for the Aran Grounds stock.

STECF COMMENTS: STECF agrees with the advice from ICES. STECF notes that prior to 2007 landings by some fleets probably have been underreported. The implementation of "sales notes" in Ireland in 2007, coupled with the increased TAC in 2007, have probably improved the reliability of reported landings data. STECF further notes, that the advised landings for 2010 imply a reduction of 36% relative to the 2008 landings (1100 t). To move toward a fishing mortality corresponding to MSY in steps, a reduction of the catch corresponding to the higher boundaries of F0.1 could be considered as an intermediate step toward the lower boundaries of $F_{0.1}$ (as a proxy for F_{msy}). Alternatively, a constraint on the year-to-year change in catches as is typical of management plans might be considered.

FISHING OPPORTUNITIES FOR 2010 ACCORDING TO ANNEX II OF COM (2009) 224

With the background of the latest scientific assessments and advice and with reference to the Communication from the Commission (COM (2009) 224) on a consultation on fishing opportunities for 2010, STECF notes that the *Nephrops* in Aran Grounds (FU 17) may be classified under Category 6

Accordingly STECF notes that the rules for each of the above categories imply the following options for TACs in 2010.

	2010 TAC	Basis
Category 6	NE*	State of stock not known precisely.

*** NE- not estimable**

STECF notes that the advised catch for 2010 should not exceed 704 t

2. Stocks of the North West Atlantic (NAFO)

2.1. American plaice (*Hippoglossoides platessoides*) in Divisions 3L, 3N and 3O

Multi-year Advice for 2010-2011 was provided for this stock in 2009.

FISHERIES: Historically, American plaice in Div. 3LNO, has comprised the largest flatfish fishery in the Northwest Atlantic.

In most years the majority of the catch has been taken by offshore otter trawlers. There was no directed fishing in 1994 and there has been a moratorium since 1995. Catches increased after the moratorium until 2003 after which they began to decline. Total catch in 2006 was 2 800 tons, 3 620 t in 2007 and 2 500 t in 2008.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is NAFO. The advice is based on biomass and abundance data from several surveys as well as on age sampling from Canadian by-catch and length, sampling from Russia, EU-Spain and EU-Portugal. An analytical assessment using the ADAPTive framework tuned to the Canadian spring and autumn surveys and Spanish Div. 3NO survey was used.

PRECAUTIONARY REFERENCE POINTS: Good recruitment has rarely been observed in this stock when SSB has been below 50 000 tons and this is currently the best estimate of B_{lim}. In the current assessment SC adopted an F_{lim} of 0.4 consistent with stock history and dynamics for this stock. The stock is currently below B_{lim} and current fishing mortality is below F_{lim} .

STOCK STATUS: The stock remains low compared to historic levels although SSB is approaching Blim. Estimated recruitment at age 5 indicates that the 2003 year class is the largest since the 1985 year class. Since 1995, the average fishing mortality on ages 9 to 14 increased but since 2003 has declined. **RECENT MANAGEMENT ADVICE:** : There should be no directed fishing on American plaice in Div. 3LNO in 2010 and 2011. By-catches of American plaice should be kept to the lowest possible level and restricted to unavoidable by-catch in fisheries directing for other species. The Scientific Council notes that levels of bycatch allowed for this stock in the yellowtail flounder fishery has been increased for 2010 and 2011 and this is likely to result in an increase in fishing mortality.

The next full assessment of this stock will be conducted in 2011.

STECF COMMENTS: STECF agrees with the advice from NAFO remarking that the level of catches is too high for a stock under moratorium.

2.2. American plaice (*Hippoglossoides platessoides*) in Divisions 3M (Flemish Cap)

Multi-year Advice for 2009-2011 was provided for this stock in 2008.

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FISHERIES: On Flemish Cap, the stock of American plaice mainly occurs at depths shallower than 600 m. Catches of Contracting Parties, in recent years, are mainly taken as by-catch in trawl fisheries directed at other species in this Division. Nominal catches increased during the mid-1960s, reaching a peak of about 5,300 tons in 1965, followed by a sharp decline to values less than 1,100 tons till 1973. Since 1974, when this stock became regulated, catches ranged from 600 t (1981) to 5,600 t (1987). Subsequently, catches declined to 275 t in 1993, caused partly by a reduction in directed effort by the Spanish fleet in 1992. From 1979 to 1993 a TAC of 2,000 t was agreed for this stock. A reduction to 1,000 tons was agreed for 1994 and 1995 and a moratorium has been in place since 1996. The catch for 2007 was estimated to be 76 t.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is NAFO. The advice is based on biomass and abundance data from surveys carried out by USSR/Russia (1972-2002), EU (1988-2007) and Canada (1978-1986). Age-length keys were available from EU surveys (1988-2007). Length compositions were available from the 1988 to 2007 fisheries. In 2008 an analytical assessment (XSA) was performed**.**

PRECAUTIONARY REFERENCE POINTS: Based on the 18 years data available from the XSA to examine a stock/recruitment relationship, a proxy for Blim will be 5 000 tons of SSB.

STOCK STATUS: The stock biomass and the SSB are at a very low level and there is no sign of recovery.

RECENT MANAGEMENT ADVICE: There should be no directed fishery on American plaice in Div. 3M in 2009, 2010 and 2011. Bycatch should be kept at the lowest possible level.

STECF COMMENTS: STECF agrees with the advice from NAFO.

2.3. Capelin (*Mallotus villosus*) in Divison 3N and 3O.

Multi-year Advice for 2010-2012 was provided for this stock in 2009.

FISHERIES: There has not been a directed fishery since 1993 when a moratorium was established and no commercial catches have been reported since then.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is NAFO. Capelin catches from Canadian bottom trawl surveys conducted in 1990-2008, as well as historical data sets from Russian and Canadian trawl acoustic surveys directed to capelin.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: It is not clear that the data satisfactorily reflect the stock distribution and stock status. Nevertheless, and in spite of recent increases in survey indices, SC was unable to consider that the stock is at other than a relatively low level.

RECENT MANAGEMENT ADVICE: Scientific Council noted that NAFO recognizes the role that capelin play in the Northwest Atlantic ecosystem as a very important prey species for fish, marine mammals and seabirds. Scientific Council recommends no directed fishery on capelin in Div. 3NO in 2010-2012.

STECF COMMENTS: STECF agrees with the advice from NAFO.

2.4. Cod (*Gadus morhua*) in Division 2J, 3K and 3L.

The management advisory body for this stock is the Canadian Science Advisory Secretariat and any management decision is completely undertaken by Canada. NAFO Scientific Council is no longer requested by the Coastal State of Canada to provide management recommendations or advice on the status of this stock.

2.5. Cod (*Gadus morhua*) in Division 3M (Flemish Cap)

Information on this stock is updated from NAFO Scientific Council Reports, 2009.

FISHERIES: The fishery is under moratorium since 1999. Yearly bycatches between 2000 and 2005 were below 60 t, rising to 339 and 345 t in 2006 and 2007, respectively. In 2008 catches increased to 889 tons.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is NAFO. Length and age compositions of the 2002-2005 bycatch were not available. Length distributions were available for 2006 - 2008, although sampling levels were low. Abundance at age indices were available from the EU bottom trawl survey since 1988, covering the whole distribution area of the stock. Survey age-length keys were applied to the bycatch.

An analytical assessment based on an age-structured model was accepted to estimate the state of the stock.

PRECAUTIONARY REFERENCE POINTS: A spawning biomass of 14 000 t has been identified as *Blim* for this stock. There is a high probability that spawning biomass is above *Blim* in 2009.

STOCK STATUS: Despite the significant spawning biomass increase, stock numbers are still much lower than before 1995. As a result of changes noted in weight and maturity, it is unclear whether the meaning of spawning biomass as an indicator of stock status is the same as in the earlier period. Whereas recruitment has been better during 2005-2008, it is below levels in the earlier period. **RECENT MANAGEMENT ADVICE:** Scientific Council considers that there is sufficient evidence to allow a small amount of directed fishing on this stock. Considering the relatively low number of mature individuals currently in the stock, Scientific Council advises that a fishing mortality for 2010 not to exceed F2008 (TAC of 4125 t) will allow further recovery of the stock.

STECF COMMENTS: STECF notes that the Scientific council management advice of fishing at F2008, corresponds to a TAC of 4125t for 2010.STECF notes that the NAFO Fisheries Commission has set a TAC of 5500 t for 2010 which corresponds to a fishing mortality rate less than F0.1 and is consistent with the NAFO precautionary approach.

2.6. Cod (*Gadus morhua*) in Divisions 3N and 3O

Multi-year Advice for 2008-2010 was provided for this stock in 2007.

FISHERIES: This stock occupies the southern part of the Grand Bank of Newfoundland. Cod are found over the shallower parts of the bank in summer, particularly in the Southeast Shoal area (Div. 3N) and on the slopes of the bank in winter as cooling occurs. There has been no directed fishery since mid-1994 but catches increased steadily during this moratorium to 2003. The total catch of cod for 2007 in Div. 3NO from all fisheries was estimated to be 845 t.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is NAFO. Length and age composition data were available from the 2005 and 2006 fisheries to estimate the total removals at age. Canadian spring (1984-2005) and autumn (1990-2006) survey data provided abundance, biomass and age structure information. Canadian juvenile research survey data were available up to 1994. Canadian Cooperative Industry surveys were available from 1996-2004. Spanish Div. 3NO surveys were available from 1997-2006.

An analytical assessment was presented to estimate population numbers in 2007.

PRECAUTIONARY REFERENCE POINTS: The current best estimate of *Blim* is 60 000 tons. It was also concluded that in the recent period of low productivity, there is an indication of even further reduction in recruitment at about half the *Blim* level. The Scientific Council will review in detail the biological reference points in the context of the PA framework when the SSB has reached half the current estimate of *Blim*.

STOCK STATUS: In 2007 the assessment concluded that the total biomass and spawning biomass were estimated to be at extremely low levels. Based on overall indices for the current year, there is nothing to indicate a change in the status of this stock. It is too early to determine if the 2006 and 2005 year-classes are larger than other recent cohorts.

RECENT MANAGEMENT ADVICE: There should be no directed fishing for cod in Div. 3N in 2008, 2009 and 2010. Bycatches of cod should be kept to the lowest possible level and restricted to unavoidable bycatch in

fisheries directed for other species. Efforts should be made to reduce current levels of bycatch. The next full assessment will be in 2010.

STECF COMMENTS: STECF agrees with the advice from NAFO.

2.7. Greenland Halibut (*Reinhardtius hippoglossoides*) in Sub-area 2 and Divisions 3KLMNO

Information on this stock is updated from NAFO Scientific Council Reports, 2009.

FISHERIES: TACs prior to 1995 were set autonomously by Canada; subsequent TACs have been established by Fisheries Commission. Catches increased sharply in 1990 due to a developing fishery in the NAFO Regulatory Area in Div. 3LMNO and continued at high levels during 1991-94. The catch was only 15 000 to 20 000 tons per year in 1995 to 1998 as a result of lower TACs under management measures introduced by the Fisheries Commission. The catch increased since 1998 and by 2001 was estimated to be 38 000 tons, the highest since 1994. The estimated catch for 2002 was 34 000 tons. The 2003 catch could not be precisely estimated, but was believed to be within the range of 32 000 tons to 38 500 tons. A fifteen year rebuilding plan for this stock has been implemented by Fisheries Commission. The catches in 2004 - 2008 have exceeded the rebuilding plan TACs by 30% on average, despite reductions in fishing effort. The 2008 catch was estimated to be 21 000 tons.**SOURCE OF MANAGEMENT ADVICE:** The main management advisory body is NAFO. Standardized estimates of CPUE were available from fisheries conducted by Canada, EU- Spain and EU-Portugal. Abundance and biomass indices were available from research vessel surveys by Canada in Div. 2+3KLMNO (1978-2008), EU in Div. 3M (1988-2008) and EU-Spain in Div. 3NO (1995-2008). Commercial catch-at-age data were available from 1975-2008. The Canadian autumn survey of 2008 is not comparable with previous years due to survey coverage deficiencies.An analytical assessment using Extended Survivors Analysis (XSA) tuned to the Canadian spring (Div. 3LNO; 1996-2007), and autumn (Div. 2J, 3K; 1996-2007) and the EU (Div. 3M; 1995-2007) surveys has been used up to 2009 to estimate the 5+ exploitable biomass, level of exploitation and recruitment to the stock.

In 2009 however, SC reviewed the impact of the incomplete survey coverage of the Canadian fall survey. It was determined that the coverage deficiencies within Divs. 2J3K were such that the mean numbers per tow index from Divs. 2J3K could not be considered comparable to that of previous years. This survey index has been used to calibrate the XSA in recent years and has received the majority of the weight used to estimate the survivors. It is therefore critical to the XSA assessment that the indices from this survey are consistent from year to year and the Scientific Council concluded that it would not be appropriate to update that analytical assessment as the Canadian Div. 2J3K data for 2008 were not comparable to those from previous years.

PRECAUTIONARY REFERENCE POINTS: Limit reference points could not be determined for this stock. For this stock F_{max} is estimated to be 0.34 and $F_{0.1}$ is 0.18 based upon average weights and partial recruitment patterns from the past 3 years.

STOCK STATUS: Given that SC did not consider it appropriate to update the analytical assessment, overall stock status has been based upon estimates from the previous assessment. At that time, SC noted that the exploitable biomass has been declining in recent years and the 2004-2008 estimates are amongst the lowest in the series. Recent recruitment has been far below average, and fishing mortality, although decreasing, remains high.

RECENT MANAGEMENT ADVICE: To provide a consistent increase of the 5+ exploitable biomass, Scientific Council **recommended** that fishing mortality in 2010 should be reduced to a level not higher than $F_{0.1}$.

The Council reiterates its concern that the catches taken from this stock consist mainly of young, immature fish of ages several years less than that at which sexual maturity is achieved. In recent years, the proportion of older individuals in the catch has decreased. Scientific Council noted that the prospects of rebuilding this stock have, to date, been hampered by catches that have exceeded the Rebuilding Plan TACs.

Scientific Council expressed concern that most of the year-classes which will recruit to the exploitable biomass in coming years (as estimated from the 2008 assessment) have been estimated to be well below average.

SC reviewed the issue of using CPUE indices in the assessment and confirmed its view that CPUE indices for this stock should not be interpreted to reflect stock size.

During previous assessments, Scientific Council has noted that fishing effort should be distributed in a similar fashion to biomass distribution in order to ensure sustainability of all spawning components.

STECF COMMENTS: STECF agrees with the advice given by NAFO. STECF regrets that due to incomplete coverage of one of the most important survey for the assessment of this stock, no analytical assessment could be carried in 2009. STECF is also concerned by the internal inconsistency in surveys indices causing a strong retrospective pattern. Although a specific workshop was held in 2009 to investigate different assessment models, nothing conclusive could be drawn from this work. More work is needed to better assess this stock and the first priority to achieve this is to maintain consistent time series of survey data.

2.8. Greenland Halibut (*Reinhardtius hippoglossoides*) in Sub-area 0 + Division 1A Offshore *and Divisions 1B-1F*

Information on this stock is updated from NAFO Scientific Council Reports, 2009.**FISHERIES:** Before 1984, USSR and GDR conducted trawl fisheries in the offshore part of Div. 0B. In the late-1980s catches were low and mainly taken by the Faeroe Islands and Norway. In the beginning of the 1990s catches taken by these two countries increased and Canada, Russia and Japan entered the fishery. In 1995 a Canadian gillnet fishery began. In 1997 and 1998 only Faeroe Island and Canada conducted a fishery in the area. Besides Canadian trawlers, trawlers from four different countries chartered by Canada participated in the trawl fishery in Div. 0A in 2001-2003. In 2004 all catches (3 740 tons) in Div. 0A were taken by Canadian vessels, almost exclusively trawlers.

In Div. 1A offshores and Div. 1B-1F almost all catches are taken offshore mainly by trawlers from Japan, Greenland, Norway, Russia, Faeroe Islands and EU (mainly Germany).

Due to an increase in offshore effort, catches increased from 3 000 t in 1989 to 18 000 t in 1992 and remained at about 10 000 t until 2000. Since then catches increased gradually to 24 000 t in 2006 primarily due to increased effort in Div. 0A and in Div. 1A. Catches were 22 000 t in 2008. S**OURCE OF MANAGEMENT ADVICE:** The main management advisory body is NAFO. No analytical assessment could be performed. Combined standardized catch rates in Div. 0A and Div. 1AB have been stable since 2002. The combined Div. 0B and 1CD standardized catch rates have been stable in the period 1990-2001, declined somewhat in 2002 remained at that level in 2003 and 2004. Since then the standardized catch rates have increased gradually and were in 2008 at the highest level seen since 1989.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: Div 0A+1AB: Length compositions in the catches have been stable in recent years. Survey biomass in Div. 0A and CPUE indices in Div. 0A and 1AB have been stable in recent years. Div. 0B+1C-F: Survey biomass in Div. 1CD and CPUE indices in Div. 0B and 1CD have shown an increasing trend in recent years and are at the level observed in the late 1980s.

RECENT MANAGEMENT ADVICE: Div 0A+1AB: Considering the relative stability in biomass and CPUE indices, for Greenland halibut in Div. 0A and 1AB Scientific Council advises that there is no basis to change advice for Div. 0A and Div. 1A off shore + Div. 1B for 2010 and the TAC should not exceed 13 000 t. Div. 0B+1C-F: Taking into account the increasing trends in survey and CPUE indices for Greenland halibut in Div. 0B and Div. 1C-F an increase in TAC can be considered. A 25% increase in catch would raise an index of F to 96% of the long-term mean. Scientific Council advises that the TAC for Greenland halibut in Div. 0B and 1C-F for 2010 should not exceed 14 000 t.

STECF COMMENTS: STECF agrees with the advice from NAFO.

2.9. Shrimp (*Pandalus borealis)* in Division 3M (Flemish Cap)

STECF noted that although advice was given in September 2009, the requests for advice on northern shrimp (Northern shrimp in Div. 3M and Div. 3LNO) will be undertaken again during the NAFO Scientific Council Meeting scheduled for 21-29 October 2009). The text below reflects the advice given in September 2009.

FISHERIES: The shrimp fishery in Div. 3M began in 1993. Initial catch rates were favourable and, shortly thereafter, vessels from several nations joined. Between 1993 and 2004 the number of vessels ranged from 40-110. In 2006 there were approximately 20 vessels fishing shrimp in Div. 3M. No information is available on the number of vessels taking part in the shrimp fishery in 2007 and 2008.Total catches were approximately 27,000 tons in 1993, increased to 48,000 tons in 1996, declined in 1997 and increased steadily through 2000. Catches in 2004 were 45 000 tons then dropped to13 000 tons in 2008 and 3 000 t in 2009 (to September).

The fishery was unregulated in 1993. Sorting grates and related by-catch regulations were implemented in 1996. and have continued to the present day. This stock is now under effort regulation.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is NAFO. Catch, effort and biological data were available from several Contracting Parties. Time series of size and sex composition data were available mainly from two countries between 1993 and 2005 and survey indices were available from EU research surveys (1988–2009). For lack of samples from the commercial fishery since 2006, length distributions from the EU survey have been used instead. Problems about suspected misreporting of catches since 2005 have been resolved to enable a standardized CPUE series which also accounted for changes in gear (single, double and triple trawl), fishing power and seasonality.

No analytical assessment was available. Evaluation of stock status was based upon interpretation of commercial fishery and research survey data.

PRECAUTIONARY REFERENCE POINTS: Scientific Council considers that 15% of the maximum survey female biomass index, i.e. 2 600 t, is a limit reference point for biomass (Blim) for northern shrimp in Div. 3M. It is not possible to calculate a limit reference point for fishing mortality. The biomass is now estimated to be below Blim.

STOCK STATUS: The indices of biomass in the July 2009 survey showed a sharp decline, confirming recent downward trends, even though the levels of exploitation have been low since 2005. The most recent estimate of stock size is below Blim. Due to the continued poor recruitment, there are also serious concerns that the stock will stay at low levels.

RECENT MANAGEMENT ADVICE: The stock is now below Blim i.e. has now entered the collapse zone defined by the NAFO PA framework, and recruitment prospects remain poor. Therefore, the Scientific Council recommends that the fishing mortality be set as close to zero as possible in 2010.

STECF COMMENTS: STECF agrees with the advice from NAFO on the basis of single stock management. STECF also noted that in its September 2009 report, the Scientific Council agrees that although not fully investigated, an inverse relationship exists between the biomass of cod and the biomass of shrimp. NAFO decided to reopened the 3M cod fishery with a TAC of 5500 t in 2010. However this should not have a strong impact on the cod biomass which is projected to increase further. The status of the shrimp stock will be again reviewed during the October 2009 meeting of the joint ICES/NAFO NIPAG WG. Any management decision should take into consideration the predator/prey relation between cod and shrimp. STECF noted that no management decision has been taken for the shrimp stock yet and that NAFO Fisheries Commission will have an inter-sessional meeting 16 November in London to discuss the issue

2.10. Shrimp (*Pandalus borealis)* in Division 3LNO

STECF noted that that although advice was given in September 2009, the requests for advice on northern shrimp (Northern shrimp in Div. 3M and Div. 3LNO (Item 1)) will be undertaken again during the NAFO Scientific Council Meeting scheduled for 21- 29 October 2009). The text below reflects the advice given in September 2009.

FISHERIES: Most of this stock is located in Div. 3L and exploratory fishing began there in 1993. The stock came under TAC regulation in 2000, and fishing has been restricted to Div. 3L. Several countries participated in the fishery in 2008. The use of a sorting grid to reduce bycatches of fish is mandatory for all fleets in the fishery. Catches have fluctuated around 20 000t in recent years.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is NAFO. Catch, effort and biological data were available from the commercial fishery. Biomass and recruitment indices as well as size and sex composition data were available from research surveys conducted in Div. 3LNO during spring (1999 to 2009) and autumn (1996 to 2008). The Canadian survey in autumn 2004 was incomplete. Analytical assessment

methods have not been established for this stock. Evaluation of the status of the stock is based upon interpretation of commercial fishery and research survey data.

PRECAUTIONARY REFERENCE POINTS: Scientific Council considers that the point at which a valid index of stock size has declined by 85% from the maximum observed index level provides a proxy for Blim for northern shrimp in Div. 3LNO. It is not possible to calculate a limit reference point for fishing mortality. The SSB is still expected to be well above Blim, but the 2008 value is not yet available. Scientific Council notes that the most recent values for fishable biomass put the stock above Blim.

STOCK STATUS: Biomass indices peaked in 2007 and have since declined. The most recent survey index, i.e. from spring 2009, is 65% lower than the 2007 value. Scientific Council was unable to update its information on the size distribution of the stock.

RECENT MANAGEMENT ADVICE: The most recent survey results show a steep decline in stock size, and Scientific Council urges caution in the setting of TACs. This downturn in biomass is unexpected as recruitment has been reasonable in recent years. The recent exploitation rates of about 14% may be too high. Scientific Council therefore urges caution in the exploitation of the stock and considers that exploitation rates should not be raised, but kept below recent levels.

STECF COMMENTS: STECF agrees with the advice from NAFO.

2.11. Redfish (*Sebastes spp*.) in Divisions 3L and 3N

The Scientific Council reviewed the status of Div. 3LN redfish from an interim monitoring report in June 2009 and found no significant change in the status of this stock Information on this stock given below is updated from NAFO Scientific Council Reports, 2008.

There are two species of redfish, *Sebastes mentella* and *Sebastes fasciatus*, which occur in Div. 3LN and are managed together. These are very similar in appearance and are reported collectively as redfish in statistics. Most studies the Council has reviewed in the past have suggested a closer connection between Div. 3LN and Div. 3O, for both species of redfish. However, differences observed in population dynamics between Div. 3O and Div. 3LN suggests that it would be prudent to keep Div. 3LN as a separate management unit.

FISHERIES: The average reported catch from Div. 3LN from 1959 to 1985 was about 22 000 t ranging between 10 000 t and 45 000 t. Catches increased sharply from about 21 000 t in 1985, peaked at an historical high of 79 000 t in 1987 then declined steadily to about 450 t in 1996. Catch increased from 900 t in 1998, the first year under a moratorium on directed fishing, to 3 100 t in 2000. Catches declined from 2001 until 2006, with an historic low of 496 t, but recorded over a three time fold increase in 2007 with a catch estimate of 1 660 t. Since 1998 catches were taken as bycatch primarily in Greenland halibut fisheries by EU-Portugal, EU-Spain and Russia.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is NAFO. Catches from 1959-2007, a 1959-94 CPUE series from STATLANT data (as derived in the 1997 assessment), and most of the stratified-random bottom trawl surveys conducted by Canada and Russia in various years and seasons in Div. 3L and Div. 3N, from 1978 onwards.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: The available Div. 3LN survey indices indicate an increase in stock in recent years broadly to level seen in the first half of the 1980s. However the considerable inter-annual variability of the survey indices makes the measurement of the magnitude of the stock increase difficult to quantify. In addition stock length structure has been improving from small to medium size fish, confirming the survival of recent year-classes regardless of their low sizes and the lack of good recruitment for more than a decade.

RECENT MANAGEMENT ADVICE: Scientific Council recommends that the total catch of Div. 3LN redfish in 2009 not exceed 3 500 t. This total catch should include any directed catches and all bycatches of Div. 3LN redfish taken in other fisheries. Before making a recommendation for 2010, Scientific Council will review this in 2009, when the catch in 2008 is known.

STECF COMMENTS: STECF agrees with the advice from NAFO.

2.12. Redfish (*Sebastes spp*.) in Division 3M

Multi-year Advice for 2010-2011 was provided for this stock in 2009.

There are three species of redfish that are commercially fished on Flemish Cap; deep-sea redfish (*Sebastes mentella*), golden redfish (*Sebastes marinus*) and Acadian redfish (*Sebastes fasciatus*). The present assessment evaluates the status of the Div. 3M beaked redfish stock, regarded as a management unit composed of two populations from two very similar species (Sebastes mentella and Sebastes fasciatus). The reason for this approach is that evidence indicates this is the dominant redfish group on Flemish Cap.

FISHERIES: The redfish fishery in Div. 3M increased from 20 000 tons in 1985 to 81 000 tons in 1990, falling continuously since then until 1998 1999, when a minimum catch around 1 100 tons was recorded mostly as by-catch of the Greenland halibut fishery. An increase of the fishing effort directed to Div. 3M redfish is observed during the first years of the present decade, pursued by EU-Portugal and Russia fleets. A new golden redfish fishery occurred on the Flemish Cap bank from September 2005 onwards on shallower depths above 300m, basically pursued by Portuguese bottom trawl and Russia pelagic trawl. This new reality implied a revision of catch estimates, in order to split recent commercial catch from the major fleets on Div. 3M into golden and beaked redfish catches. In 2001-2003 the redfish by-catch in numbers from the Flemish Cap shrimp fishery was 78% of the total catch numbers, declining to 44% in 2004 and 15% in 2005. Catches in 2007 and 2008 were respectively of 6 700 t and 8 500 t following an increase of TAC from 5 000 t in 2007 to 8 500 t in 2008.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is NAFO. The advice is based on catch-at-age data from 1989-2006 including by-catch information from the shrimp fishery.

There are three bottom trawl survey series providing biomass indices as well as length and age data for the Flemish Cap redfish stocks; Russia (1983-93, 1995 96 and 2001-2002), EU (1988-2008) and Canada (1979-85 and 1996). The Russian survey was complemented with an acoustic estimate of the redfish pelagic component for the 1988-92 period. Survey bottom biomass and female spawning biomass were calculated from 1988-2008 EU surveys. A virtual population (XSA) was carried out for 1989 2008. The assessment was consistent with the results of the 2005 and 2007 XSA's. Although the assessment was accepted it exhibits poor diagnostics and was not considered reliable for projections.

PRECAUTIONARY REFERENCE POINTS: No updated information on biological reference points is available.

STOCK STATUS: Scientific Council concluded that the stock biomass and spawning biomass are increasing. Nonetheless the spawning stock is currently still at a low level compared to the earlier period in the time series. At the low fishing mortalities of the most recent years and with growth of the relatively strong recent year-classes, spawning biomass should continue to increase.

RECENT MANAGEMENT ADVICE: Low fishing mortalities should be maintained so as to promote female spawning stock recovery. Scientific Council recommends that catch for all redfish in Div. 3M in 2010 and 2011 should not exceed 8 500 tons which is in the range of catches in recent years.

This stock will next be assessed in 20011.

STECF COMMENTS: STECF agrees with the advice from NAFO.

2.13. Redfish (*Sebastes* spp.) in Sub-area 1

Multi-year Advice for 2009-2011 was provided for this stock in 2008.

Denmark, on behalf of Greenland, requested the Scientific Council to: provide advice on the scientific basis for the management of Redfish (*Sebastes spp*.) and other finfish in Subarea 0+1 for 2009-2011.
There are two redfish species of commercial importance in Sub-area 1: golden redfish (*Sebastes marinus*) and deep-sea redfish (*Sebastes mentella*). These are very similar in appearance and are reported collectively as redfish in statistics. Their relationship to other north Atlantic redfish stocks is unclear.

FISHERIES: Historically, redfish were taken mainly as a by-catch in the trawl fisheries for cod and shrimp. However, occasionally during 1984-86, a directed fishery on redfish was observed for German and Japanese trawlers. With the collapse of the Greenland cod stock during the early-1990s, resulting in a termination of that fishery, catches of commercial sized redfish were taken inshore by long lining or jigging and offshore in shrimp

fisheries only. Recent catch figures do not include the weight of substantial numbers of small redfish discarded by the trawl fisheries directed at shrimp.

In 1977, total reported catches peaked at 31,000 t. During the period 1978-83, reported catches of redfish varied between 6,000 t and 9,000 t. From 1984 to 1986, catches declined to an average level of 5,000 t due to a reduction of effort directed to cod by trawlers from EU-Germany. With the closure of the offshore fishery in 1987, catches decreased further to 1,200 t, and have remained at that low level. Redfish is mainly taken as by-catch by the offshore shrimp trawlers; reported bycatches in from 2004 to 2007 are 500 t per year. However, this must be considered an underestimation.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is NAFO. The advice is based on EU-German groundfish surveys (1982-2007), Greenland-Japan and Greenland deep-sea surveys (1987-95 and 2000), and Greenland bottom trawl surveys (1988-2007).

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock

STOCK STATUS: The stock of golden redfish (*S. marinus*) in Subarea 1 remains severely depleted, although some signs of rebuilding are observed.
The spawning stock of deep-sea redfish (*S. mentella*) in Subarea 1 remains severely depleted, and an increase is unlikely in the short term.

RECENT MANAGEMENT ADVICE: No directed fishery should occur on demersal redfish in Subarea 1 in 2009, 2010 and 2011. Bycatches in the shrimp trawl fishery should be kept at the lowest possible level.

STECF COMMENTS: STECF agrees with the advice from NAFO.

2.14. Redfish (*Sebastes* spp.) in Division 3O

Multi-year Advice for 2008-2010 was provided for this stock in 2007.

There are two species of redfish that have been commercially fished in Div. 3O; the deep sea redfish (*Sebastes mentella*) and the Acadian redfish (*Sebastes fasciatus*). These are very similar in appearance and are reported collectively as redfish in statistics. Most studies the Council has reviewed in the past have suggested a closer connection between Div. 3LN and Div. 3O, for both species of redfish. However, differences observed in population dynamics between Div. 3LN and Div. 3O suggested that it would be prudent to keep Div. 3O as a separate management unit.

FISHERIES: Nominal catches have ranged between 3,000 and 35,000 tons since 1960. Up to 1986 catches averaged 13,000 tons then increased to 35,000 tons in 1988. From 2002-2003 catches averaged 17 200 tons then declined dramatically to about 3 800 tons in 2004. Catches in 2005 and 2006 were higher at about 11000 tons and 13 000 tons respectively. Total catch of redfish in 3O was estimated to be 5 200 t in 2007.

SOURCE OF MANAGEMENT ADVICE: Within Canada's fisheries jurisdiction redfish in Div. 3O have been under TAC regulation since 1974 and a minimum size limit of 22cm since 1995, whereas catch was only regulated by mesh size in the NRA of Div. 3O. The Scientific Council was unable to advice on a TAC in 2003. In September 2004, the Fisheries Commission adopted TAC regulation for redfish in Div. 3O, implementing a level of 20 000 tons per year for 2005-2007. This TAC applies to the entire area of Div. 3O.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: Surveys indicate the stock has remained stable since 2001 but at a lower level than the mid-1990s.

RECENT MANAGEMENT ADVICE: Catches have averaged about 13 000 tons since 1960 and over the long term, catches at this level appear to have been sustainable. The Scientific Council noted that over the period from 1960 to 2006, a period of 47 years, catches have surpassed 20 000 tons in only three years. The Scientific Council noted there is insufficient information on which to base predictions of annual yield potential for this resource. Stock dynamics and recruitment patterns are also poorly understood. Scientific Council is unable to advise on an appropriate TAC for redfish in Div. 3O in 2008, 2009 and 2010.

The next full assessment of this stock is planned to be in 2010.

STECF COMMENTS: STECF agrees with the advice from NAFO.

2.15. Roughhead grenadier (*Macrourus berglax*) in Sub-areas 2 and 3

Multi-year Advice for 2008-2010 was provided for this stock in 2007.

The NAFO Scientific Council reviewed the status of this stock (interim monitor) at this June 2008 meeting. Based on overall indices for the current year, Scientific Council found no significant change in the status of this stock. The next full assessment of this stock is planned to be in 2010.

Roughhead grenadier is distributed throughout Subareas 2 and 3 in depths between 300 and 2,000 m. This is not a regulated species.

FISHERIES: There is no directed fishery for roughhead grenadier and most of the catches are taken as bycatches in the Greenland halibut fishery in Subareas 2 and 3. Roughhead grenadier is taken mainly in Div. 3LMN Regulatory Area. From 1993 to 1997 the level of the catches was around 4 000 tons. The highest level of observed catches (7 231 tons) was reached in 1998. From then until 2004 catches were around 3 000 tons. In 2005 and 2006, catches declined further to 1500 tons. A total catch of 664 t was estimated for 2007.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is NAFO. The advice is based on various bottom trawl surveys, which partially cover the distributional area of the roughhead grenadier population. Additionally, data on depth distribution and biological parameters are available. Because of limited time series, limited coverage and various vessel/gears conducting these surveys, the information is of limited value in determining resource status. It is not possible to provide an estimate of the absolute size of the stock.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for roughhead grenadier in Sub-areas 2 and 3.

STOCK STATUS: Current fishing mortality is the lowest of the available series and although the strong 2001 year-class seems to be weaker than expected, the assessment results showed that current estimates of biomass are the highest of the time series.

RECENT MANAGEMENT ADVICE: In 2007, an analytical assessment was presented but it was not accepted due to the uncertainty in the results. NAFO advised that it is not possible to provide any advice for roughhead grenadier in Sub-areas 2 and 3.

The next assessment will be held in 2010.

STECF COMMENTS: STECF has no comment.

2.16. Roundnose Grenadier (*Coryphaenoides rupestris*) in Sub-areas 0+1

Multi-year Advice for 2009-2011 was provided for this stock in 2008.

Denmark, on behalf of Greenland, requested the Scientific Council to: provide advice on the scientific basis for the management of Roundnose grenadier in Subarea 0+1 for 2009-2011.

FISHERIES: Recommended TACs were at 8,000 t over the period 1977-95. The advice since 1996 has been that the catches should be restricted to bycatches in fisheries targeting other species. There has been no directed fishery for this stock since 1978. An unknown proportion of the reported catches of roundnose grenadier are roughhead grenadier (*Macrourus beglax*).

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is NAFO. The advice is based on biomass estimates of roundnose grenadier from surveys in Div. 0B during the period 1986-92, from 1CD in 1997-2007 and Div. 0B in 2000-2001. No analytical assessment could be performed.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for roundnose grenadier in Sub-areas 0+1.

STOCK STATUS: The stock of roundnose grenadier is still at the very low level observed since 1993. The biomass of the stock component in SA 0+1 has been at a very low level since 1993 and the stock is composed of small individuals.

RECENT MANAGEMENT ADVICE: There should be no directed fishing for roundnose grenadier in Subareas 0 and 1 in 2009-2011. Catches should be restricted to bycatches in fisheries targeting other species.

STECF COMMENTS: STECF agrees with the advice from NAFO

2.17. Northern Shortfin Squid (*Illex illecebrosus*) in Subareas 3 and 4

STECF notes that a full assessment of Northern shortfin squid was requested by the NAFO Fisheries Commission. However, the expertise needed to complete this task was not available during the Scientific Council meetings since 2008.

Information on this stock is updated from NAFO Scientific Council Reports, 2008.

The northern short-finned squid (*Illex illecebrosus*) is an annual species (1-year life cycle) and is considered to comprise a unit stock throughout its range in the Northwest Atlantic Ocean, from Newfoundland to Florida including NAFO Sub-areas 3-6.

FISHERIES: Catches in Sub-areas 3+4 increased during the late-1970s, averaging 81,000 t during 1976-81, and peaking at 162,000 t in 1979. Catches in Sub-areas 3+4 declined to 100 t in 1986, ranged between 600 and 11,000 t during 1987-95, increased to 15,800 t in 1997. After 1997, catches ranged between 100 tons in 2001 and 2 300 tons in 2004. Catches in Subareas 3+4 in 2007 (230 t) was substantially lower than in 2006 (6 900 t).

A TAC for Sub-areas 3+4 was first established in 1975 at 25,000 t, but was increased in 1978, 1979 and 1980. The Sub-area 3+4 TAC remained at 150,000 tons during 1980-1998 and was set at 75,000 tons for 1999 and 34,000 tons for 2000-2007.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is NAFO.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for short finned squid in Sub-areas 3+4.

STOCK STATUS: During 2006, indices of relative abundance and biomass were the fourth highest on record in the Div. 4VWX July survey. The values of the index in 2004 and 2006 were the highest two observed since the onset of the low productivity period beginning in 1982.

RECENT MANAGEMENT ADVICE: The Scientific Council's monitoring report indicates no significant change in the status of this stock and therefore Scientific Council advises that the TAC for 2009 be set between 19 000 and 34 000 t.

STECF COMMENTS: STECF agrees with the advice from NAFO.

2.18. Thorny Skate (*Amblyraja radiata*) in Divisions 3L, 3N and 3O and Subdivision 3Ps

Multi-year Advice for 2009-2010 was provided for this stock in 2008.

FISHERIES: Thorny skate in Div. 3LNO was previously treated as an assessment unit within NAFO. However, distribution dynamics and studies on biological characteristics suggest a single stock within Div. 3LNOPs. This report treats thorny skate within Div. 3LNOPs as the stock unit.

Commercial catches of skates comprise a mixture of skate species. However, thorny skate represents about 95% of the skates taken in the catches. Thus, the skate fishery on the Grand Banks can be considered as a directed fishery for thorny skate.

The main participants in this fishery are EU-Spain, Canada, Russia and EU-Portugal. Catches peaked at about 31,500 tons in 1991, and averaged 8 600 t from 1992-1995.Catch levels as estimated by STACFIS on Div. 3LNOs averaged 9 050 t during the period 2000-2007. This species came under quota regulation in 2004, when the Fisheries Commission set a TAC of 13 500 tons for 2005-2007 in Div. 3LNO and Canada set a TAC of 1 050 t for Subdiv. 3Ps.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is NAFO. The Canadian spring survey biomass indices fluctuated without trend prior to the mid-1980s then declined rapidly until the early-1990s. The biomass has been stable during the 1996 to 2004 period. During recent years the biomass appears to be increasing.

PRECAUTIONARY REFERENCE POINTS: Reference points are not available for thorny skate at this time.

STOCK STATUS: The current state of the stock is unclear compared to the historic (pre-1980s) period. The biomass has been relatively stable from 1996 to 2004 but at a lower level than in the mid-1980s During 1995-2004, average catch as estimated by STACFIS was about 11 900 tons. Recent catches from 2005-2007 averaged 5 580 t during a period when biomass indices increased slightly.

RECENT MANAGEMENT ADVICE: To promote recovery of thorny skate, Scientific Council recommended that catches in 2009 and 2010 should not exceed 6 000 t (the average catch during the past three years) in NAFO Divisions 3LNOPs.

STECF COMMENTS: STECF agrees with the advice from NAFO

2.19. White hake (*Urophycis tenuis*) in Divisions 3N, 3Oand Subdivision 3Ps.

Multi-year Advice for 2010-2011 was provided for this stock in 2009.

The stock area is defined by Scientific Council as Div. 3NOPs, and is mainly concentrated in southern Subdiv. 3Ps and on the southwestern Grand Bank. Scientific Council is asked to provide advice on the portion of the stock in Div. 3NO only.

FISHERIES: Catches in Div. 3NO peaked in 1985 at 8,100 tons, and then declined from 1988 to 1994 (2,090-ton average). Average catch was at its lowest between 1995 and 2001 (464 tons); then increased to 6,700 tons in 2002 and 4,800 tons in 2003. Total catch decreased to an average of 848 tons in 2006-2008.Catches of White Hake in Subdiv. 3Ps were at their highest in 1985-1993, averaging 1 114 tons, decreasing to an average of 668 tons in 1994-2003. Subsequently, catches in Subdiv. 3Ps have averaged 1 068 tons during the period 2006-2008.

SOURCE OF MANAGEMENT ADVICE: Length frequency data from the Canadian fishery (1994-2008), and from the catches of EU-Spain (2002, 2004), EU-Portugal (2003-2004, 2006-2008), and Russia (2000-2006) were available. Biomass and abundance indices were available from annual Canadian spring in Div. 3LNOPs (1972-2008), autumn in Div. 3LNO (1990-2008) bottom trawl surveys and Spanish spring surveys in the NAFO Regulatory Area of Div. 3NO (2001-2008).

PRECAUTIONARY REFERENCE POINTS: The Scientific Council was unable to define reference points for this stock.

STOCK STATUS: The biomass of this stock increased in 2000 with the large 1999 year-class. Subsequently, the biomass index has decreased and remains at levels comparable to the beginning of the Canadian Campelen time series in 1996-1998.**RECENT MANAGEMENT ADVICE:** Given the current level of recruitment, SC advises that catch of White Hake in Div. 3NO, at the current TAC (2009) of 8 500 tons, is unrealistic. Catches for 2010 and 2011 should not exceed their current levels of 850 tons in 3NO. Catches for 2010 and 2011 should not exceed their current levels of 1050 tons in subdivision 3Ps.The next assessment of this stock will be in 2011.

STECF COMMENTS: STECF agrees with the advice from NAFO.

2.20. Witch Flounder (*Glyptocephalus cynoglossus*) in Divisions 2J, 3K and 3L

Multi-year Advice for 2008-2010 was provided for this stock in 2007.

Historically, the stock occurred mainly in Div. 3K although recently the proportion of the stock in Div. 3L is greater. In the past, the stock had been fished mainly in winter and springtime on spawning concentrations but is now only a bycatch of other fisheries.

FISHERIES: During the late-1970s and early-1980s witch flounder were widely distributed around the fishing banks, primarily in Division 3K. During however, they were rapidly disappearing and by the early-1990s, had virtually disappeared from this area entirely; except from some very small catches along the continental slope in southern part of Division 3K. They now appear to be located only along the deep continental slope area, especially in Division 3L both inside and outside the Canadian 200-mile fishery zone. The catches during 1995-

2004 ranged between 300 and 1 400 tons including unreported catches. The 2005 catch declined to 155 tons and the 2006 catch was only 84 tons. The catches in 2007 were 53 t, the lowest catch in the time series.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is Canada. NAFO Scientific Council has recently been asked to evaluate the status of the resource. The advice is based on abundance and biomass data from Canadian autumn surveys (1977-2007). Age based data have not been available since 1993, and none are anticipated in the near future. The last assessment of this stock was carried out in 2001 and no analytical assessment has been possible since then.

PRECAUTIONARY REFERENCE POINTS: In the absence of an analytical assessment, Blim was calculated as 15% of the highest observed biomass estimate (Blim = 9 800 tons). Since the highest observed biomass estimates are in the early part of the time series when the survey did not cover the entire stock area, Blim may be underestimated using this method. Nevertheless, the stock has been below this limit reference point since 1992.

STOCK STATUS: Based on the most recent data, it is considered that the overall stock remains at a very low level. Based on survey indices for the current year, there is nothing to indicate a change in the status of the stock.

The next full assessment of this stock is scheduled for 2010.

RECENT MANAGEMENT ADVICE: In 2007, NAFO advised that there should be no directed fishing on witch flounder in 2008, 2009 and 2010 in Div. 2J, 3KL to allow for stock rebuilding. Bycatches of witch flounder in fisheries targeting other species should be kept at the lowest possible level.

STECF COMMENTS: STECF agrees with the advice from NAFO.

2.21. Witch Flounder (*Glyptocephalus cynoglossus*) in Divisions 3N and 3O

Multi-year Advice for 2009-2011 was provided for this stock in 2008.
The stock mainly occurs in Div. 3O along the southwestern slopes of the Grand Bank. Traditionally, the fishery took place on spawning concentrations in the winter and spring.

FISHERIES: Catches exceeded the TAC by large margins during the mid-1980s. The catches from 1995-2002 ranged between 300-800 t including unreported catches. Catch for 2003 was estimated to be between 844 and 2 239 t. Catches in 2006 and 2007 were 481 t and 222 t respectively.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is NAFO. The advice is based on converted abundance and biomass data from Canadian spring surveys during 1984-2007 and autumn surveys during 1990-2007. Biomass data is available from the Spanish Div. 3NO spring surveys during 1995-2001 in Pedreira units and 2001-2007 in Campelen units.

PRECAUTIONARY REFERENCE POINTS: The reference points for this stock are not determined.

STOCK STATUS: Stock remains at a low level.

RECENT MANAGEMENT ADVICE: No directed fishing on witch flounder in the years 2009, 2010 and 2011 in Div. 3N and 3O to allow for stock rebuilding. Bycatches in fisheries targeting other species should be kept at the lowest possible level.

STECF COMMENTS: STECF agrees with the advice from NAFO.

2.22. Yellowtail Flounder (*Limanda ferruginea*) in Divisions 3L, 3N and 3O

Information on this stock is updated from NAFO Scientific Council Reports, 2009.

FISHERIES: The stock is mainly concentrated on the southern Grand Bank and is recruited from the Southeast Shoal area nursery ground, where the juvenile and adult components overlap in their distribution.

There was a moratorium on directed fishing from 1994 to 1997, and small catches were taken as bycatch in other fisheries. The fishery was re-opened in 1998 and catches increased from 4 400 t in 1998 to 13 900 t in 2005. TACs were exceeded each year from 1985 to 1993, and 1998- 2001, but not since 2002. In 2006 and 2007 catches were much lower than the TACs. In 2008, catches increased to 11 400 tons, but remained lower than the TAC of 15 500 tons.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is NAFO. Abundance and biomass indices were available from: annual Canadian spring (1971-82; 1984-2008) and autumn (1990-2008) bottom trawl surveys; annual USSR/Russian spring surveys (1972-91); and Spanish surveys in the NAFO Regulatory Area of Div. 3NO (1995-2008).An analytical assessment using a stock production model was accepted to estimate stock status in 2009

PRECAUTIONARY REFERENCE POINTS: Scientific Council considered that 30% Bmsy is a suitable limit reference point (Blim) for this stock and that the limit reference point for fishing mortality (Flim) should be no higher than Fmsy. Currently the biomass is estimated to be above Blim and F, below Flim, so the stock is in the safe zone as defined in the NAFO Precautionary Approach Framework.**STOCK STATUS:** Stock size has steadily increased since 1994 and is currently estimated to be 1.6 times B_{MSY}.

RECENT MANAGEMENT ADVICE: Although biomass is well above Bmsy, Scientific Council does not consider it prudent to fish above 85% Fmsy because of the uncertainty in the estimation of Fmsy. Scientific The Council therefore recommends any TAC option up to 85% Fmsy for 2010 (25 500 t) and 2011 (23 500).

STECF COMMENTS: STECF agrees with the advice from NAFO.

3. Resources in the area of CECAF

STECF was unable to update the stock status and advice for some of the stocks in the area of CECAF. Consequently, the text for such stocks remains unchanged from the STECF Consolidated review of advice for 2009 (STECF, 2009)

Section 3 contains the most recent information for those stocks in the area of CECAF that are currently exploited by fleets from the EU. Formerly, information and advice on the status of resources in the region not exploited by EU fleets were also included in this section of the report.

The CECAF (Committee for the Eastern Central Atlantic Fisheries) region covers the FAO area 34, which extends from the Gibraltar Strait (36ºN) down to the mouth of the Congo river (6ºS) including the archipelagos of Madeira, the Canaries, Cape Vert and Sao Tomé e Principe. Recently, in 2006, Angola has joined the CECAF, broadening to the south the jurisdictional area of the organization down to the border with Namibia (around 18ºS).

European fisheries in the CECAF region are conducted under fishing agreements between the European Union and most of the coastal countries. These agreements refer to a wide range of resources including crustaceans (shrimps, prawns and crabs), cephalopods (octopus, cuttlefish and squid), small pelagics (sardine, sardinellas, horse mackerels, mackerel and anchovy), demersal finfish (hakes, seabreams, groupers, croakers, etc.) and tuna fish. The latter group of resources is of the responsibility of the ICCAT (International Commission for the Conservation of the Atlantic Tuna) and assessments on the state of these stocks are presented in Section 14 of this report.

Fishing agreements have evolved along the time. In 1999, finished that negotiated with Morocco and subsequently two other important agreements such those of Angola and Senegal came also to an end in 2004 and 2006, respectively. The last fishing agreement with Guinea expired in December 2008. On the other hand, a new fishing agreement was reached between the European Union and Mauritania in 2006 for a period of six years, reviewable every two years. The most recent fishing agreement between the European Union and Guinea Bissau was signed in 2007 for a period of four years, extendable for identical periods. Furthermore, in 2007 a new fisheries partnership agreement has been signed with Morocco, but it only allows for exploiting a limited number of finfish resources expressly prohibiting any catch of crustaceans or cephalopods. This section of the report refers to the state of the stocks currently exploited by European fleets in the CECAF region.

The most recent assessments and advice provided in this report are based on the results of the CECAF Working Group on the Assessment of Small Pelagics off Northwest Africa held in Nouakchott (Mauritania) from the 21 to the 30 April 2009, on those of the Working Group on demersal resources in the northern zone which met in Banjul (The Gambia) from 6 to 14 November 2007, and on those of the Working Group on demersal resources in the southern zone which met in Freetown (Sierra Leona) from the 8 to the 18 October 2008. The results from

the assessments have not yet been formally published and therefore the information provided in Section 3 is to be regarded as preliminary and may be subject to change.

3.1. Sardine (*Sardina pilchardus*) off Morocco, Western Sahara (under Moroccan administration), Mauritania and Senegal

FISHERIES: Sardine is exploited along the Moroccan and the Western Sahara shelves in four different fishing grounds referred to as north stock (between 33ºN and 36ºN), central stock including zone A (between 29ºN and 32ºN) and zone B (between 26ºN and 29ºN), and southern stock or zone C (between 22ºN and 26ºN). Currently, zone north is exploited by a reduced number of small purse seiners from the north of Morocco. Fisheries for sardine in zones A and B are exclusively carried out by Moroccan boats. Those in zone C were fished by 10 Spanish purse seiners, based in Arrecife de Lanzarote (Canary Islands), during the last fishing agreement currently elapsed, and by an unknown number of Moroccan purse seiners and long distance trawlers from Russia, Ukraine, Norway, Netherlands, and other countries. The non-Moroccan vessels operate under bilateral or private fishing agreements.

The new fisheries partnership agreement between Morocco and the EU entered into force in 2007 permits vessels from Europe to fish for small pelagics, including sardine, using pelagic trawls in zone C. To date no boat has made a request for a licence under this provision.

In 2008 and 2007, the sardine catch from zone A was 32 000 and 11 000 tonnes respectively. Catch in this zone has seen some recovery since the sharp decrease in 1996. The specific composition of the sardine fleet landings in this zone has experienced a significant change over the last few years. Sardine, which was the predominant species in the catch, has declined, giving way to mackerel, which is essentially caught off the Bay of Agadir. The northern zone has decreased from around 13 000 and 11 000 tonnes. On the other hand, catch of sardine in Zone B has shown relative stability in 2007 (356 000 t), increasing from around 446 000 tonnes in 2008.

Moroccan Zone C registered a decrease in sardine catch from around 183 000 tonnes in 2007 and 162 000 t in 2008. This zone has been exploited by a heterogeneous fleet working within the framework of different access regimes. In addition to traditional coastal purse seiners and Moroccan RSW vessels, the fleets operating in this area also includes pelagic trawlers operating under a fishing agreement between Morocco and the Russian Federation and boats (purse seiners, RSW and freezer trawlers) chartered by Moroccan operators.

The sardine catch in the Mauritanian zone saw an increase, climbing from almost 73 000 tonnes in 2006 to a catch of 85 000 tonnes in 2007 and 75 000 tonnes in 2008. Catches are carried out on a seasonal basis by pelagic trawlers from the European Union (EU) and the Russian Federation.

Catch in the Senegalese zone was estimated at 12 000 tonnes in 2007 and 4 000 tonnes in 2008.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is the FAO Committee for the Eastern Central Atlantic Fisheries (CECAF). Assessment Working Groups have traditionally considered that the sardine from zones A and B belong to a single stock named the central stock, and that those from zone C constituted a separate unit stock called the southern stock. The last FAO Working Group on the Assessment of Small Pelagics off Northwest Africa was held in Nouakchott (Mauritania) from the 21 to the 30 April 2009.

PRECAUTIONARY REFERENCE POINTS: Reference points were defined in the FAO Working Group on the Assessment of Small Pelagics off Northwest Africa that was held in Banjul (Gambia) in 2006. B_{MSY} and F_{MSY} were adopted as Limit Reference Points, while $B_{0.1}$ and $F_{0.1}$ were chosen for Target Reference Points.

STOCK STATUS: The Schaefer logistical dynamic production model was used to assess the two stocks, A+B and C using the BioDyn model. Forecasting of catch abundance for the following five years was based on different management scenarios using the same model.

The results for Zone A+B showed that the estimated biomass in 2008 was slightly greater than B0.1 and fishing mortality lower than $F_{0.1}$. The relationship $Bcur/B_{0.1}$ showed that the stock is currently considered fully exploited.

For Zone C, the results indicate that the estimated biomass in 2008 was greater than $B_{0.1}$ and the fishing mortality lower than $F_{0.1}$. Sardine in this C, does not show signs of over exploitation and the estimated biomass index from the regional survey (November–December) increased in 2007 as compared to 2006, followed by a

decrease of 18% in 2008. Nevertheless, given the fluctuations observed in the abundance of this stock care should be taken in its management.

RECENT MANAGEMENT ADVICE:

Central stock: The situation for the Sardine stock in Zone A+B seems to have improved since 2006 and this stock is now considered fully exploited. As a precautionary measure, and taking into consideration the fluctuations observed in this stock, the working groups maintains the 2008 recommendation that catches should not exceed 400 000 tonnes.

Southern stock: The results of the model indicated that the stock is moderately exploited. The total catch level may be temporarily increased, but should be adjusted to natural changes in the stock. It was recommended that the stock structure and abundance should be closely monitored by fishery independent methods.

STECF COMMENTS: STECF has no comments

3.2. Anchovy (*Engraulis encrasicolus*) off Morocco and Mauritania

FISHERIES: Anchovy is exploited in the northern region of the Moroccan coast by purse seiners from Morocco. Catches in this region by purse seiners are mainly composed of anchovy, sardine (*Sardina pilchardus*) and mackerel (*Scomber japonicus*). The activity of Moroccan boats is unknown. In the region the anchovy is also fished in Mauritania. Anchovy is not the main target of the fishery in the area, but large quantities are caught as by-catch by industrial pelagic trawlers fishing for sardinella, horse mackerel or mackerel.

The fisheries partnership agreements between EU-Morocco and EU-Mauritania have allowed for fishing possibilities for purse seiners and pelagic trawlers, targeting anchovy in the northern zone of Morocco and in Mauritania respectively. Under the 2007 EU-Morocco agreement, a fleet of 11 boats from the south of Spain commenced fishing from June 2007. So far no data are available on this activity. No European pelagic trawlers have requested a licence to fish for anchovy in Mauritania.

Total anchovy catches in the region increased steadily between 1996 and 2003, increasing from 20,000 tonnes to around 180,000 tonnes. In 2004 and 2005 the total anchovy catch dropped by 46 percent compared to 2003. In 2006, catches saw an increase of nearly 43 percent with respect to 2005. Catch increased around 139 000 tonnes and 122 000 tonnes in 2007 and 2008, respectively. This increase was registered for the most part in Mauritania.

Since 1995, Mauritania's share of the total catch has increased steadily. It has risen from 8 percent of total anchovy catch in 1995 to 84 percent in 2008.

It should be noted that around 85 percent of total anchovy catch in the region is caught in Mauritania and that Russian and Ukrainian fleets, which account for about 70 percent of the Mauritanian total, play an important role. In 2006, the increase in catch by these fleets can be explained by the resolution of technical and financial problems of previous years. Recent integration into the European Union of countries such as Latvia (previously counted in the group of other industrial fisheries) has increased the catch of anchovy by the EU.

It is therefore possible to conclude that the increase in total anchovy catch in the region in 2006 can be explained partly by the high increase in European, Russian and Ukrainian effort in Mauritania, and, to a lesser extent, by that of the Moroccan fleet in zone B.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is the FAO Committee for the Eastern Central Atlantic Fisheries (CECAF). Anchovy is assessed by the Working Group on the Assessment of Small Pelagics off Northwest Africa. This Working Group met in Nouakchott (Mauritania) from the 21 to the 30 April 2009.

PRECAUTIONARY REFERENCE POINTS: No reference points have been proposed for this stock.

STOCK STATUS: An exploratory LCA analysis was conducted in 2009 to identify the most targeted length classes in the Moroccan zone, and the Thompson and Bell model of catch by recruit was applied. Results showed the stock fully exploited.

A series of acoustic survey was carried out in 2008 by different vessels in the region. Estimates of anchovy biomass are summarised in the following table:

	Cap Spartel-Sidi Ifni R/V AL AMIR	Sidi Ifni-Cap Blanc R/V AL AMIR	Cap Cantin-Cap Blanc R/V AL AMIR	Cap Safi-St Louis ATLANTIDA	Mauritania R/V AL AWAM
Biomass estimates (tonnes)	102 000	178 000	105 000	0	24 000
Survey season	April	May-June	December	July-August	November

RECENT MANAGEMENT ADVICE: As a precautionary measure, it was recommended that the effort level should not exceed current level.

STECF COMMENTS: STECF has no comments

3.3. Black hake (*Merluccius senegalensis* and *Merluccius polli*) off Western Sahara (under Moroccan administration), Mauritania and Senegal

FISHERIES: The so-called black hake is a commercial category made of Senegalese hake (*Merluccius senegalensis*) and Benguela hake (*Merluccius polli*). These species tend to occur in waters off Western Sahara, Mauritania and Senegal where they are target of a specialized fleet of Spanish trawlers. A Spanish fleet of longliners also exploit them, but to a lesser extend. This fleet formerly operated on the shelf of all three countries, depending on the seasonal abundance of hake in the different areas. The interruption of the fishing agreements with Morocco and Senegal stopped this practice and for some time, the fishery was restricted to Mauritanian waters. Following the new (2007) agreement with Morocco, in 2007, fishing for black hake by Spanish fleets has extended to the Western Sahara (under Moroccan administration) and Mauritania.

The combined catch of black hake in the whole CECAF region varied between 7 253 t and 22 244 t over the period 1983-2006. Most of the catches of these species are made in Mauritania where they have observed a cyclical but general increasing trend from 1983 to 2001 when a maximum historic value of 16 104 t was attained. Since then, catches have experienced a sharp steady decline, reaching a minimum of 7 253 t in 2006. The Spanish trawler fleet accounted for almost 100% of the catches made between 1983 and 1991. In subsequent years other fleets started fishing for black hake in Mauritania and the importance of the Spanish trawlers catches decreased to an average of around 65% with minimums slightly higher than 50% in 2005 and 2006. Other important fleet components in this fishery are Mauritanian trawlers.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is the FAO Committee for the Eastern Central Atlantic Fisheries (CECAF). *Merluccius senegalensis* and *Merluccius polli* are regularly assessed by the Working Group on demersal resources in the northern zone which last meeting was held in Banjul (The Gambia) from 6 to 14 November 2007.

PRECAUTIONARY REFERENCE POINTS: Reference points defined for small pelagics in the FAO Working Group held in Banjul (The Gambia) in 2006 were also adopted for the black hake stock. These are B_{MSY} and F_{MSY} for Limit Reference Points and $B_{0.1}$ and $F_{0.1}$ for Target Reference Points.

STOCK STATUS: The Schaefer logistical dynamic production model was used to assess the stock. For Mauritania, the current abundance of black hake is well below that required to produce maximum sustainable yield (B_{cur}/B_{MSY}= 45%). Current fishing effort is 26% higher than that corresponding to $F_{0.1}$ but smaller than that allowing to keep the stock biomass at the current level (F_{cur}/F_{SYcur}= 73%). These results clearly show that the stock is overexploited although there is a chance for recovery if no increase in fishing effort is allowed.

RECENT MANAGEMENT ADVICE: For the Mauritanian stock, it was recommended that fishing effort be reduced in order to allow better yields in the future. This recommendation should be applied both to the fleet that directly targets black hake and to fleets that target other demersal species, as these have large by-catches of black hake. Further recommendation is to keep catches at a maximum level of 7 000 t.

STECF COMMENTS: STECF has no comments.

3.4. Octopus (*Octopus vulgaris*) off Mauritania

FISHERIES: The cephalopod fishery in Mauritania started in 1965. Since then Japanese, Korean, Libyan, Spanish, Portuguese, Chinese and Mauritanian fleets have all exploited these resources. Currently, some 200 Mauritanian freezer trawlers, most of them re-flagged from other nationalities, and a substantial artisanal fleet of around 900 canoes fishing with pots (poulpiers), continue to fish the cephalopods in Mauritania. Since 1995 Spanish vessels have returned to the fishery after several decades of absence, with around 25 freezer trawlers currently involved in the fishery. Octopus (*Octopus vulgaris*) is the target species in this fishery followed in importance by cuttlefish (mainly *Sepia hierredda*), squid (*Loligo vulgaris*) and a miscellaneous group of many different finfish species.

Overall catches of octopus in the period 1990-2006 have ranged from a minimum of 17,400 t in 1998 and a maximum of 44,600 t in 1992. Production of Spanish trawlers has steadily increased from 1995 until 2000 when it peaked at a value of 12,265 t. Catches then decreased until 2003 (6402 t) and increased slightly in 2004 (7321 t) and 2005 (9306 t). In 2006, the Spanish catch of octopus was again smaller than in preceding years attaining a value of 6482 t. Catches of Mauritanian trawlers represent around 40% of the total production of octopus. The artisanal fleet fishing for octopus has very much evolved in recent years contributing around 22% to the total catch of the species in 2006.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is the FAO Committee for the Eastern Central Atlantic Fisheries (CECAF). *Octopus vulgaris* is regularly assessed by the Working Group on demersal resources in the northern zone which met in Banjul (The Gambia) from 6 to14 November 2007.

PRECAUTIONARY REFERENCE POINTS: Reference points defined for small pelagics in the FAO Working Group held in Banjul (Gambia) in 2006 were also adopted for the octopus stock. These are B_{MSY} and F_{MSY} for Limit Reference Points and $B_{0.1}$ and $F_{0.1}$ for Target Reference Points.

STOCK STATUS: The Schaefer dynamic production model was used to assess the stock. Results showed that current biomass is half of that producing the target biomass ($B_{cur}/B_{0.1}$= 51%) and that fishing mortality is higher than that needed to reach the target $F_{0.1}$ ($F_{cur}/F_{0.1}$= 143%). The Mauritanian octopus stock is therefore overexploited.

RECENT MANAGEMENT ADVICE: Taking into account the assessment results it was recommended a general reduction in fishing effort for all fleets involved in the fishery.

STECF COMMENTS: STECF has no comments.

3.5. Cuttlefish (*Sepia hierredda*) off Mauritania

FISHERIES: Cuttlefish species are taken as a by-catch in the same cephalopod fishery as octopus. The cuttlefish catch can be composed of several different species among which *Sepia hierredda* is the most abundant one. Production of that species in Mauritania has varied between 2373 t (2006) and 7722 t (1993) over the period 1984-2002. General trend of catches is decreasing with periodic maximums located in years 1993 (2373 t), 2001 (6555 t) and 2005 (4025 t). Most of these catches are taken by Mauritanian trawlers which contribute an average of more than 80% to the total production of the species.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is the FAO Committee for the Eastern Central Atlantic Fisheries (CECAF). The cuttlefish is regularly assessed by the Working Group on demersal resources in the northern zone which met in Banjul (The Gambia) from 6 to14 November 2007.

PRECAUTIONARY REFERENCE POINTS: Reference points adopted for this species are the same than those of most species in the region. These are B_{MSY} and F_{MSY} for Limit Reference Points and $B_{0.1}$ and $F_{0.1}$ for Target Reference Points.

STOCK STATUS: The Schaefer dynamic production model was applied to assess the stock. The fitting of the model to the available observed data was not satisfactory and the CECAF Working Group was unable to interpret the results. Nevertheless, abundance indices from annual research cruises conducted in Mauritania show a decreasing trend of cuttlefish biomass suggesting a state of overexploitation of the stock.

RECENT MANAGEMENT ADVICE: Taking into account the uncertainties surrounding the assessment results and the indications of progressive decline on biomass of the stock as from the research cruises, the CECAF Working Group decided to recommend a reduction in fishing effort.

STECF COMMENTS: STECF has no comments.

3.6. Coastal prawn (*Farfantepenaeus notialis*) off Mauritania

FISHERIES: The crustaceans of commercial importance in Mauritanian waters are exploited by a specialized fleet from Spain that targets different species among which are, in order of importance, the shrimp (*Parapenaeus longirostris*), the prawn (*Farfantepenaeus notialis*), the crab (*Chaceon maritae*) and the deep water shrimp (*Aristeus varidens*). Catches of *Farfantepenaeus notialis* made by these boats have varied between 405 t (1993) and 2 165 t (1999) over the period 1987-2006. Spanish catches in recent years show an increasing trend since 2003 (815 t) until 2006 (1 791 t). There are other fleet segments composed of freezer trawlers from Mauritania and from other foreign origins. Catches by Mauritanian freezer trawlers have increased from very low levels in 1992 (8 t) to a maximum of 807 t in 2002 followed by a more or less stable period with catches of around 700 t per year. Catches of other foreign freezer trawlers are much more fluctuating ranging from 31 t in 1996 to 929 t in 2005.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is the FAO Committee for the Eastern Central Atlantic Fisheries (CECAF) and *Farfantepenaeus notialis* is assessed by the Working Group on demersal resources in the northern zone which met in Banjul (The Gambia) from 6 to14 November 2007.

PRECAUTIONARY REFERENCE POINTS: Reference points adopted for this species are B_{MSY} and F_{MSY} for Limit Reference Points and $B_{0.1}$ and $F_{0.1}$ for Target Reference Points.

STOCK STATUS: The Schaefer dynamic production model was applied to assess the stock. The fitting of the model is rather good indicating that the Mauritanian stock of *Farfantepenaeus notialis* appears to be fully exploited. The current biomass is very close to the target biomass $B_{0.1}$.

RECENT MANAGEMENT ADVICE: It was recommended to reduce fishing effort from the level observed in 2006.

STECF COMMENTS: STECF has no comments.

3.7. Deepwater shrimp (*Parapenaeus longirostris*) off Mauritania

FISHERIES: This species is fished in the same fishery than that of *Farfantepenaeus notialis*. *Parapenaeus longirostris* is the main target species in the fishery accounting for more than 50% to the total production. Total catches of this species have ranged from 497 t to 4269 t between years 1987 and 2006. On average, the Spanish freezer trawler fleet accounts for more than 80% of the catches.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is the FAO Committee for the Eastern Central Atlantic Fisheries (CECAF) and *Parapenaeus longirostris* is assessed by the Working Group on demersal resources in the northern zone, which met in Banjul (The Gambia) from 6 to14 November 2007.

PRECAUTIONARY REFERENCE POINTS: Reference points adopted for this species are B_{MSY} and F_{MSY} for Limit Reference Points and $B_{0.1}$ and $F_{0.1}$ for Target Reference Points.

STOCK STATUS: The Schaefer dynamic production model was applied to assess the stock. In Mauritania the stock appears to be fully exploited. The biomass is close to $B_{0.1}$ and the fishing mortality in 2006 is also close to the target reference point.

RECENT MANAGEMENT ADVICE: The CECAF Working Group recommended no increase in fishing effort.

STECF COMMENTS: STECF has no comments.

3.8. Atlantic horse mackerel (*Trachurus trachurus*) and Cunene horse mackerel (*Trachurus trecae*) off Mauritania and other countries in the northern CECAF region.

FISHERIES: Under the framework of the new fishing agreement with Mauritania, the number of European vessels authorised to fish for small pelagics at the same time is fixed at 22 units. With respect to the previous agreement (2001–2006), where the number of vessels was fixed at 15, this is an important increase. A ceiling of 440 000 tonnes per year has been placed on total authorised catches, covering all species (sardinellas, horse mackerel, etc.). The current agreement includes new member states of the EU (Baltic States, Cyprus), which were already present in the Mauritanian zone. These fleets generally target horse mackerel.

The Atlantic horse mackerel is distributed off Western Sahara (under Moroccan administration) and Mauritania, while the cunene horse mackerel is mainly found in Mauritanian and Senegalese waters. The limit of the distribution of these stocks is subject to long-term variations. This greatly influences the catch of these species in Mauritania. Exploitation of horse mackerel is carried out by vessels of varying size, from the local artisanal canoes to the large pelagic trawlers.

The two horse mackerel species (*Trachurus trachurus* and *Trachurus trecae*) occupy neighbouring ecological niches and represented almost 94 percent of the total horse mackerel catch in 2007 and 2008. *Trachurus trachurus* is mainly fished to the north of Cape Blanc and *Trachurus trecae* to the south. The artisanal fishery catches account for only a small proportion of the overall catch, in the order of 1.3 percent in 2007 and 2.4 percent in 2008.

Even though total catches of the two horse mackerel species together have increased successively over the period 2003–2005 (from around 165 000 t to 393 000 t), in 2006 landings decreased by 5 percent, reaching a maximum of 407 000 t and 462 000 t in 2007 and 2008, respectively.

The cunene horse mackerel (*Trachurus trecae*) is the most important species. Catches of this species decreased from 270 000 tonnes in 2005 to around 250 000 tonnes in 2006. They increased again in 2007 and 2008 to around 307 000 t and 358 000 tonnes, respectively. The majority of the catch of this species is taken in the Mauritanian zone (82-85 percent). Catches of the Atlantic horse mackerel (*Trachurus trachurus*) were around 104 000 tonnes in 2008 whereas catches of false scad (*Caranx rhonchus*) were 31 000 tonnes for the same year.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is the FAO Committee for the Eastern Central Atlantic Fisheries (CECAF). *Trachurus trachurus* and *Trachurus trecae* are assessed by the Working Group on the Assessment of Small Pelagics off Northwest Africa. This Working Group met in Nouakchott (Mauritania) from the 21 to the 30 April 2009.

PRECAUTIONARY REFERENCE POINTS: Reference points were defined in the FAO Working Group on the Assessment of Small Pelagics off Northwest Africa that was held in Banjul (Gambia) in 2006. The indices B_{MSY} and F_{MSY} were adopted as Limit Reference Points, while the indices $B_{0.1}$ and $F_{0.1}$ were chosen for Target Reference Points.

STOCK STATUS: Stock assessment of the two horse mackerel species was carried out using a surplus production model.

Regarding *Trachurus trachurus* the application of the model used the abundance index series from regional acoustic surveys. The results showed that the estimated biomass in 2008 was slightly lower tha $B_{0.1}$ and the fishing mortality was greater (13%) than $F_{0.1}$. The relationship $Bcur/B_{0.1}$ showed that the stock is currently considered fully exploited. The state of the stock of Atlantic horse mackerel (*T. trachurus*) seems to have improved in 2008, due probably to a good recruitment in 2007.

For *Trachurus trecae* global CPUE was used to fit the model. Results indicated that the 2008 biomass was in the middle of $B_{0.1}$ and fishing effort was greater than optimum effort. The stock was found to be over exploited, and the recruitment survey index suggested a bad recruitment for 2008 compared with 2007. In addition a change of exploitation pattern has occurred with higher catches of smaller fish in 2008.

RECENT MANAGEMENT ADVICE: As a precautionary measure and because of the mixed horse mackerel fishery, it is recommended to decrease effort by 20%. The 2009 total catches of the two species combined should not exceed the mean of (2003-2007) 330 000 tonnes.

STECF COMMENTS: STECF has no comments.

3.9. Mackerel (*Scomber japonicus*) off Mauritania and other countries in the northern CECAF region.

FISHERIES: Two chub mackerel stocks have been identified in the Northwest Africa region. The northern stock is found between Cape Bojador (Western Sahara under Moroccan administration) and the north of Morocco, and the southern stock is situated between Cape Bojador and the south of Senegal.

In the northern zone (Tangiers–Cape Bojador), the chub mackerel fishery is exploited solely by the Moroccan fleet. This fleet is composed of coastal purse seiners, which mainly target sardine but also chub mackerel depending on availability. The zone between Cape Bojador and Cape Blanc is exploited, in addition to the

Moroccan coastal purse seiners, by pelagic trawlers operating under the Morocco–Russian Federation fishing agreement, and by vessels chartered by Moroccan operators. In the zone to the south of Cape Blanc, several pelagic trawlers from different countries (Russian Federation, Ukraine, European Union and others) operate, but only targeting chub mackerel seasonally. In Senegal and The Gambia, chub mackerel is considered as by-catch by the Senegalese artisanal fleet.

Since 1991, total chub mackerel catch over the whole region has shown an increasing trend, reaching a maximum of more than 262 000 tonnes in 2008. To the south of Cape Blanc where the European fleet operates, total chub mackerel catch increased over the period 1990–1996, reaching around 100 000 tonnes. It then decreased to reach the low level of around 20 000 tonnes in 1999. Catch then progressively increased until 2003 when a record of 133 000 tonnes was recorded. Since then catches have heavily declined with 38 000 tonnes recorded in 2005 and 33 000 tonnes in 2006, reaching around 80 000 t and 60 000 t in 2007 and 2008, respectively.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is the FAO Committee for the Eastern Central Atlantic Fisheries (CECAF). *Scomber japonicus* is assessed by the Working Group on the Assessment of Small Pelagics off Northwest Africa. This Working Group met in Nouakchott (Mauritania) from the 21 to the 30 April 2009.

PRECAUTIONARY REFERENCE POINTS: Reference points were defined in the FAO Working Group on the Assessment of Small Pelagics off Northwest Africa that was held in Banjul (Gambia) in 2006. The indices B_{MSY} and F_{MSY} were adopted as Limit Reference Points, while the indices $B_{0.1}$ and $F_{0.1}$ were chosen for Target Reference Points.

STOCK STATUS: Assessments were carried out by applying a Schaefer dynamic surplus production model and ICA. Results showed the stocks fully exploited.

RECENT MANAGEMENT ADVICE: It was recommended, as a precautionary measure, that catches do not exceed the 2006 level of 200 000 tonnes.

STECF COMMENTS: STECF has no comment.

3.10. Sardinella (*Sardinella aurita* and *Sardinella maderensis*) off Mauritania and other countries in the northern CECAF region.

FISHERIES: Two species of sardinella (*Sardinella aurita* and *Sardinella maderensis*) occur in the region. The greatest exploitation of sardinella takes place in Mauritania and Senegal. This is carried out by the industrial fishery in Mauritania (EU and Russian fleets and a fleet of other vessels from Eastern Europe) and by the artisanal fishery in Senegal, most notably purse seines and the surrounding gillnets.

Total catches of *S. aurita* in the region have varied between 162 000 t (1994) and 563 000 t (2008) in the period from 1990 to 2008. For *Sardinella maderensis*, the catches show a long term increasing trend from 1997 (113 000 t) to 2003 (190 000 t). From 2003 catches decreased to a level of 118 000 t in 2008.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is the FAO Committee for the Eastern Central Atlantic Fisheries (CECAF). *Sardinella aurita* and *Sardinella maderensis* are assessed by the Working Group on the Assessment of Small Pelagics off Northwest Africa. This Working Group met in Nouakchott (Mauritania) from the 21 to the 30 April 2009.

PRECAUTIONARY REFERENCE POINTS: Reference points were defined in the FAO Working Group on the Assessment of Small Pelagics off Northwest Africa that was held in Banjul (Gambia) in 2006. The indices B_{MSY} and F_{MSY} were adopted as Limit Reference Points, while the indices $B_{0.1}$ and $F_{0.1}$ were chosen for Target Reference Points.

STOCK STATUS: The stocks of sardinella where assessed by applying the Schaefer dynamic surplus production models. The total catches of the two sardinellas by the different fleets operating in the region and the abundance indices of the coordinated regional acoustic surveys were used for the assessment of the stocks of *S. aurita* and *Sardinella* spp.
There have been significant fluctuations in the indices of abundance of *Sardinella aurita* for the past six years. While the region saw significantly increased catches of the species in Mauritania and Senegal in 2007 and 2008 respectively, the tendency since 1999 to 2007 was a decreasing biomass from 2 134 000 tonnes to 912 000

tonnes before attaining the second largest abundance in the series in 2008. From the output of the model, the Working Group concluded that the stock was at a level below the one producing maximum sustainable yield. The total catches of this species in the region in 2008 were more than twice as large as the estimated natural production from the stock, indicating that fishing mortality largely exceeded the sustainable level.
The combined species (*Sardinella* spp.) showed significant oscillations in indices of abundance for most part of the series but tapered down to almost stability in the last two years due to the sharp opposing trends observed in the *S. aurita* and *S. maderensis* biomass series in 2008. The same trends are true for catches of the two species but an attempt to fit the model produced unreliable results due to large variability in observed abundance indices in 2004 (4 046 000 tonnes) and 2005 (2 030 000 tonnes) which could not be explained. The results of *S. maderensis* were not reliable

RECENT MANAGEMENT ADVICE: The catches of round sardinella (*Sardinella aurita*) are high from the last 3 years probably associated with a very good recruitment in 2005, but there is currently no evidence of another good year class since then. For this reason the Working Group continue to be concerned about this stock and still considerers it as overexploited.

Given the overexploitation of round sardinella, it was strongly recommended that catches and effort of *Sardinella* spp. should be decreased.

STECF COMMENTS: STECF has no comments.

3.11. Other demersal finfish in Mauritanian waters

FISHERIES: This group is composed of around 100 different species that can be taken either in targeted fisheries or as by-catch in other fisheries. The targeted fishery is conducted by an unknown number of small canoes that operate from many different places in the coast using a variety of artisanal gears. Other fisheries take these species as a by-catch and only retain onboard those that have any commercial interest, the remainder being discarded. The magnitude of the catches of most of these species in Mauritania is unknown. Nevertheless, the CECAF Working Group on demersal resources in the northern zone was able to estimate annual series of production from four seabreams (family Sparidae): *Pagellus bellottii*, *Pagellus acarne*, *Dentex macrophthalmus* and *Sparus caeruleostictus*, and one grouper (family Serranidae): *Epinephelus aeneus*.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is the FAO Committee for the Eastern Central Atlantic Fisheries (CECAF). Demersal finfish are assessed by the Working Group on demersal resources in the northern zone, which met in Banjul (The Gambia) from 6 to14 November 2007.

PRECAUTIONARY REFERENCE POINTS: Reference points adopted for these species are: B_{MSY} and F_{MSY} as Limit Reference Points, and $B_{0.1}$ and $F_{0.1}$ as Target Reference Points.

STOCK STATUS: Assessments conducted by application of dynamic surplus production models and abundance indices derived from research surveys concluded that all the four seabream stocks are overexploited and that the grouper stock is close to depletion.

RECENT MANAGEMENT ADVICE: To avoid any increase in fishing mortality while more precise assessments are made available.

STECF COMMENTS: STECF has no comments.

3.12. Deepwater shrimps off Guinea Bissau

FISHERIES: Crustacean resources in Guinea Bissau are mainly made of shrimps (*Parapenaeus longirostris* and *Aristeus varidens*), prawn (*Farfantepenaeus notialis*) and crab (*Chaceon maritae*). These species are exploited in a fishery conducted by Spanish trawlers and many other foreign fleets. Total catches of crustaceans in the period 1987-1996 have fluctuated between 378 t and 1943 t. In the last CECAF Working Group only Spanish fishery data were provided. Spanish catches of *P. longirostris* oscillated between 39 t (1998) and 662 t (2005) in the period after the civil war in Guinea Bissau (1998-2007).

SOURCE OF MANAGEMENT ADVICE: CECAF is the advisory body for this area. The last published report of CECAF assessment working group on demersal resources, including crustaceans, was in 2003 (FAO/CECAF, 2006). In 1989, 1990, 1991 and 1995 IPIMAR conducted trawl surveys in a rectangle close to

the Bijago's archipelago. Biomass estimates for the prospected area in 1989, 1990, 1991 and 1995 were respectively 12.9 t, 18 t, 42.5 t and 29.7 t for *Parapenaeus longirostris*, and 7.2 t, 9.7 t, 55.3 t and 14.8 t for *Farfantepenaeus notialis*. In October 2008, the Spanish Institute of Oceanography (Instituto Español de Oceanografía, IEO) carried out a trawl survey in the EEZ of Guinea Bissau. Biomass estimates in this survey were 107 t for *P .longirostris*, 52 t for *A. varidens,* 17 t for *C. maritae* and 25 t for *F. notialis* (García-Isarch *et.al.*, 2009). For this last species, it has to be considered that the prospected area was in waters deeper than 50 m, while the prawn main distribution zone is located in shallower areas. The last assessment Working Group on demersal resources from the southern area of the CECAF region was held in Freetown (Sierra Leona) in 2008, but results are still unpublished.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for these stocks.

STOCK STATUS: Unknown

RECENT MANAGEMENT ADVICE: Not available.

STECF COMMENTS: STECF has no comments.

3.13. Deepwater shrimps off Guinea Conakry

FISHERIES: The deepwater shrimp fishery in Guinea Conakry is mainly carried out by the Spanish shrimp trawlers fleet since 1995. The target species of this fleet is the shrimp *P. longirostris,* which constitutes almost the 60% of the catches. During the period 1995-2005, catches oscillated between 1 t in 1997 and 340 t in 1998.

SOURCE OF MANAGEMENT ADVICE: CECAF is the advisory body for this area. The last published report of CECAF assessment Working Group on demersal resources, including crustaceans, was in 2003 (FAO/CECAF, 2006). The last assessment Working Group on demersal resources from the southern area of the CECAF region was held in Freetown (Sierra Leona) in 2008, but results are still unpublished.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for these stocks.

STOCK STATUS: Unknown

RECENT MANAGEMENT ADVICE: Not available.

STECF COMMENTS: STECF has no comments.

3.14. Cuttlefish (*Sepia hierredda*) off Guinea Conakry

FISHERIES: In Guinea Conakry, cephalopods are targeted by industrial and artisanal fisheries. The industrial fishery is mostly conducted by Spanish freezer trawlers that started their activities in the area in 1986. In 1990 there were 27 units fishing for cephalopods but the number has decreased in successive years with only one vessel in 1994 and varied between one and four until 2001. The target species in this fishery is the cuttlefish (*Sepia hierredda*), with a by-catch of octopus (approximately 8% of the total catch). Reported catches of octopus have varied between less than a ton and 576 t during 1986-1996. Catches of the cuttlefish (*Sepia hierredda*) made by all fleets are in the order of an average of 6 000 t in the period 1995-2001.

SOURCE OF MANAGEMENT ADVICE: CECAF is the advisory body for this area. The last CECAF assessment Working Group on cephalopods was held in Cotonou (Benin) in 2005 but results are still unpublished.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for cuttlefish in Guinea Conakry.

STOCK STATUS: Assessments were carried out using dynamic production models. Results of fitting the model were not satisfactory due to an extremely high catch in 1996. Removing this catch from the data series the model showed that the stock was overexploited.

RECENT MANAGEMENT ADVICE: Taking into account the results of the assessments and the uncertainties attached to the analyses the CECAF Working Group recommended a reduction in fishing effort.

STECF COMMENTS: STECF has no comments

4. Resources in the area of WECAF

4.1. Shrimp (*Penaeus subtilis*), French Guyana

No new information was made available on the resource status or management advice for shrimp in French Guyana in 2009.

FISHERIES: Shrimp in the French Guyana EEZ, are now exclusively taken by French shrimp trawlers. Over the historical time period of the fishery (1968-1999), catches have fluctuated between 1 500 t and 5 600 t. The high variations in catches are mainly the result of changes in fleet composition and activity (USA and Japanese fleets in the early period, and the French fleet latterly), and economical and social problems (strikes). Over recent years, landings have been stable (about 3 800 t). The assessment area includes the French Guyana EEZ.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is the IFREMER Centre in Cayenne. The assessment is based on LPUE (Landings per Unit Effort), production model, and catch-at-length analysis (cohort analysis).

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: The LPUE's series of the shrimp fleet shows seasonal trends, fluctuating around 200 kg/day. Over the period 1990-1999 there was a strong increase in average yield per day, probably due to a change fishing strategy as the fleet re-directed effort towards smallest individuals in shallower waters. Production modelling indicates an increase in the stock biomass over the last few years, coincident with a decrease in fishing effort since the early 1980's. The average biomass over 1996-1999 has been estimated at about 10 000 t, close to 2/3 of the estimated virgin biomass of 15 000 t -16,000 t. The estimated catch at 90% of MSY is close to 4 000 t, which is consistent with the present TAC of 4 108 metric tons established for the fishery.

Estimated LPUE at 90% of MSY is around 250 kg per fishing day, close to the actual catch rates in the fishery. LPUE is directly affected by the level of recruitment. Cohort analysis shows that statistically, there is no relationship between effort and fishing mortality.

RECENT MANAGEMENT ADVICE: The stock is considered to be fully exploited. A precautionary mutli-annual (5 years period) TAC of 4 108 metric tons was decided by the European Community.

STECF COMMENTS: STECF agrees with the advice given by IFREMER

5. Resources in the southeast Atlantic (SEAFO)

5.1. Orange roughy (*Hoplostethus atlanticus*), SEAFO CA

FISHERIES: the current status of the fishery is unknown.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is the SEAFO. Precautionary approach.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: The status of the stock is unknown.

RECENT MANAGEMENT ADVICE: Zero catch limit for orange roughy in Sub-Division B1 for 2010 and 2011.Catch limit of 50 t in the remaining area.

STECF COMMENTS: STECF notes that the data available for assessment of this stock are inadequate.

5.2. Patagonian toothfish (*Dissostichus eleginoides*), SEAFO CA

FISHERIES: The fishery is localized in Division D, between 40ºS and 50ºS. Three fishing grounds are in the area: Meteor Seamounts (Sub-Division D1), Discovery Seamounts (closed area) and western part of Division D seamounts. The fishery takes place as part of vessels' trips between fishing grounds on the Patagonian slope, CCAMLR fishing grounds and the Indian Ocean and a maximum of four vessels have participated in the fishery in any one year. Catches in 2008 were 160 t.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is the SEAFO. SEAFO decided to use the CCAMLR catch limit in Subarea 48.6 (north 60ºS) adjacent to SEAFO Division D.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: The status of the stock is unknown.

RECENT MANAGEMENT ADVICE: Catch limit of 200 t in the whole area.

STECF COMMENTS: STECF notes that the data available for assessment of this stock are inadequate.

5.3. Alfonsino (*Beryx* spp.), SEAFO CA

FISHERIES: the current status of the fishery is unknown.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is the SEAFO.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: The status of the stock is unknown.

RECENT MANAGEMENT ADVICE: Catch limit of 200 t in the whole area.

STECF COMMENTS: STECF notes that the data available for assessment of this stock are inadequate.

5.4. Deep-sea red crab (*Chaceon* spp.), SEAFO CA

FISHERIES: The fishery is mainly located at Valdivia Bank (Sub-Division B1) and the main targeted species is *Chaceon erytheiae* although others *chaceon* species are also distributed in the SEAFO CA. The fishery usually takes place during approximately three months per year and is carried out by one or two vessels. Landings in 2009 were 170 t.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is the SEAFO. The assessment is based on catch level in 2005 and 2006.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: The status of the stock is unknown.

RECENT MANAGEMENT ADVICE: Catch limit of 200 t in Sub-Division B1 and 200 t in the remainder of the SEAFO CA area.

STECF COMMENTS: STECF notes that the data available for assessment of this stock are inadequate.

6. Resources in the South-west Atlantic

Section 6 contains updated reviews of advice for stocks in Falkland Islands' waters, as well as first results of stocks status on the High Seas of the SW Atlantic from two research cruises carried out by IEO in March-April 2008 and March 2009. Landings information for Argentinean fleets is also included.

In October 2007, the Instituto Español de Oceanografía (IEO, Spanish Institute of Oceanography) started a series of five research cruises on the High Seas of the SW Atlantic on board the Spanish R/V Miguel Oliver, with the aim of studying Vulnerable Marine Ecosystems (VMEs) in the area between coastal states' EEZs and

the 1500 m depth contour. The last of these 5 cruises, which ended in mid-April 2008, has a primary aim of initiating a time series of research vessel survey data for use in resource assessments. A further series of six campaigns in the same zone, with the same objectives, i.e. study of VMEs, cartography, benthos, geomorphology, sediment and stock assessment, started on the 16th October 2008 and finished the 1st April 2009. The last campaign of this series, conducted between the 24th February and the 1st April 2009, was the second cruise of 2008 time series aimed at providing data for assessments of the main commercial fishery resources on the High Seas of the Southwest Atlantic. To date, the swept area biomass estimates for each of the commercially exploited resources in international waters of the Southwest Atlantic are the only estimates available. Comparative results of the two surveys are therefore reported in the appropriate stock sections. The objective of the research surveys is to present a report on the location and features of candidate VMEs in the area, identifying any potential interactions with fishing activities. The report, which will be presented to the United Nations General Assembly (UNGA) before the end of December 2009, will include a map with a proposal for Marine Protected Areas (MPAs) in international waters of the Southwest Atlantic, as well as several management recommendations on reducing the impact of fishing activities on VMEs

6.1. Patagonian hoki (*Macruronus magellanicus*), Falkland Islands

FISHERIES: Hoki is mainly caught in the western part of the Falkland Islands Interim Conservation and Management Zone (FICZ) and is targeted mainly by various European and Falkland Islands registered finfish trawlers, but also forms a bycatch in the *Loligo* fishery and by surimi vessels. Catches increased from about 10,000 t in early 1990s when they were mainly taken as a bycatch to between 16,670-26,970 t since 1998 by a targeted trawl fishery.

The lowest catch in recent years was obtained in 2005. Catches subsequently increased for 2006-2008. The total catch in January – September 2009 was 18,113 t, just below the so far recorded highest catch in 2002. Hoki is mainly targeted in two seasons, from February-May and from July-October.

SOURCE OF MANAGEMENT ADVICE: The Falkland Islands Fisheries Department (FIFD) is responsible for providing management advice to the Falkland Islands Government.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed.

STOCK STATUS: The stock is considered to be in good condition at present, however, historically, catches of hoki were quite variable and there is some concern that the current high catches may not be sustainable in the long term. Catches from 2005 to September 2007 have tended to be lower than catches in the previous years (2002-2004) and exploitation in the current year is similar to that of 2002. The reduction in recent catches is likely to have been a result of effort being diverted to the fishery for hake. The stock assessment for hoki in Falkland Islands' waters is problematic because of its migratory behaviour and only a small percentage of the stock is caught in the FICZ.

RECENT MANAGEMENT ADVICE: The advice is to hold the overall level of fishing effort in the Falkland Zone constant.

STECF COMMENTS: STECF notes the need for a multilateral approach for the assessment and management of the fisheries in the SW Atlantic through a regional fisheries organisation.

6.2. Patagonian grenadier (*Macrourus carinatus, Macrourus holotrachys*), Falkland Islands

FISHERIES: *Macrourus holotrachys* (Günther, 1878) and *M. carinatus* (Günther, 1878) are two species, inhabiting deep seas of the Southwest Atlantic. *M. carinatus* is known to be distributed on the slopes of South America and other areas between 300 and 1100 m. *M. holotrachys* occurs around South America, Falkland Islands and Shag Rocks between 150 and 1750 m depth. In Falkland Islands' waters both species are taken as a bycatch in the longline fishery targeting Patagonian toothfish (*Dissostichus eleginoides)* at depths of 650–2000 m and occasionally by trawlers at 300–350 m depth. In 2007, grenadiers were taken as a bycatch by longliners and trawlers throughout the year. Total longline bycatch was 67 tonnes, while the trawlers took 162 tonnes of fish. Dense commercial aggregations of *Macrourus carinatus* (CPUEs >15 tonnes per day) were revealed on the southern Falkland slope, mostly between 700 and 900 m.

SOURCE OF MANAGEMENT ADVICE: Falkland Island Fisheries Department (FIFD) with advice from the Renewable Resources Assessment Group (RRAG), Imperial College, together with input from the South Atlantic Fisheries Commission (SAFC).

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed.

STOCK STATUS: RECENT MANAGEMENT ADVICE: Fishing effort in Falkland Zones is being held constant.

STECF COMMENTS: STECF notes the need for a multilateral approach for the assessment and management of the fisheries in the SW Atlantic through a regional fisheries organisation.

6.3. Southern blue-whiting (*Micromesistius australis*), Falkland Islands

FISHERIES: Since 1992 Southern blue-whiting (SBW) has been mainly targeted by surimi vessels in Falkland Islands' waters. The targeted fishery mainly occurs in the Southwest of the Falkland Island Interim Conservation and Management Zone (FICZ). Southern blue whiting is also taken as an occasional by-catch by finfish trawlers.

In 2005-2006, surimi vessels have been operating only in the austral summer between October and March. Since 2007 the surimi vessels started to operate in the beginning of October and carried on until the beginning of December. During this period, vessels fished for aggregations of post-spawning fish, which were still feeding in the Falkland waters before dispersing further south.

The total catch between January – September 2009 was only 3,881 t, which was even lower than in 2008 (4,304 t), and much lower than in 2007 (9,872 t) and in 2006 (7,846 t).

SOURCE OF MANAGEMENT ADVICE: The management body is the Falkland Islands Fisheries Department (FIFD) together with advice from the Renewable Resources Assessment Group (RRAG), Imperial College.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been set for this stock.

STOCK STATUS: Both independent stock assessments of Southern blue whiting in the Southwest Atlantic performed by FIFD and RRAG in June 2009 suggested that the spawning stock biomass (SSB) decreased strongly since the early 90's (1,500,000 t) and reached a level of ~398,000 t at the end of 2008. This is approximately 26% of the spawning stock biomass in the early 1990s.

RECENT MANAGEMENT ADVICE: The total catch of Southern blue whiting should be limited to 50,000 t in the Southwest Atlantic. It was agreed to restrict the total catch of *Micromesistius australis* in the Falkland Islands' Conservation Zones to 25,000 t or maybe even lower.

Fishing in the southern region of FICZ in the spawning grounds was banned for surimi vessels from 1 August until 15 October 2009 to allow the fish to spawn undisturbed.

STECF COMMENTS: STECF notes the need for a multilateral approach for the assessment and management of the fisheries in the SW Atlantic through a regional fisheries organization.

STECF also notes that the advised TAC is well in excess of the recent reported catch levels and that recent SSB estimates are 26% of those estimated for the early 1990s.

6.4. Red cod (*Salilota australis*), Falkland Islands

FISHERIES: Red cod is fished in the western part of the FICZ mainly as a by-catch of the hoki and hake fisheries. Additionally, Spanish trawlers target red cod in spring (September-October) on their spawning grounds to the southwest of the Islands. Catches of red cod decreased from 4,649 – 9,313 t in 1996-2000 to between 2,285-2,781 t in 2003-2005. In 2006, the annual catch increased to 3,469 t, with the further increasing trend in 2007 (5,195 t). This then decreased to 4074 t in 2008. The total catch in January – September 2009 (3792 t) was higher than for the same period in 2008 due to an increased fishing effort.

SOURCE OF MANAGEMENT ADVICE: The Falkland Islands Fisheries Department (FIFD) is responsible for management advice to the Falkland Islands Government and has carried out stock assessments in 2008 and in 2009.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed.

STOCK STATUS: The stocks have had a decreasing trend in their abundance due to fishing pressure on spawning aggregations during October. Stock assessments conducted in 2008 and 2009 indicate that SSB is at 26% of virgin stock size (SSB_0).

RECENT MANAGEMENT ADVICE: The Falkland proposal has been made to ban fishing red cod in their spawning grounds in October to allow the stock to recover.

STECF COMMENTS: STECF notes the need for a multilateral approach for the assessment and management of the fisheries in the SW Atlantic through a regional fisheries organization.

6.5. Argentine hake, Austral hake (*Merluccius hubbsi, Merluccius australis*), Falkland Islands

FISHERIES: Hakes are mainly caught in the western part of the FICZ. They are targeted by Spanish and Falkland Islands' registered trawlers having a special license for unrestricted finfish. The total catch of hakes in FICZ/FOCZ (Falkland Islands Interim/Outer Conservation Zone) decreased from 12,000 t in 1990 to 1,500 t in 1994-1997, and then stabilised at the level of 1,678-3,069 t in 2000-2005. Common hake (*M. hubbsi*) are targeted mainly in winter during their migrations to the Falkland waters from the Patagonian shelf. Austral hake (*M. australis*) are targeted almost exclusively in the southwest of the Islands in September-November after their spawning in the area around the Southern tip of South America. Catches of hakes have remained at a high level for the last three years, peaking at about 12,000 t in 2007. This year, catches from January-September (11,407 t) are highly similar to those from 2007 (11,641 t).

SOURCE OF MANAGEMENT ADVICE: The Falkland Islands Government is responsible for management of hake resources.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been agreed for this stock.

STOCK STATUS: The stock of common hake in the FICZ is a 'shared' stock with Argentina with only a small proportion of the stock occurring in Falkland Zones. The stock was in poor condition in 1991-1999. After strong recruitments in 2001-2002, juvenile abundance increased 5-10 times compared to the period 1996-2000 giving rise to exceptional catches of hakes in the last three years.

RECENT MANAGEMENT ADVICE: Fishing effort in Falkland Zones for hakes is being held constant.

STECF COMMENTS: STECF notes the need for a multilateral approach for the assessment and management of the fisheries in the SW Atlantic through a regional fisheries organization.

6.6. Argentine short-finned squid (*Illex argentinus*), Falkland Islands

FISHERIES: This squid is usually a major fishery resource of the Falkland Islands in terms of total catch and licensing revenue. *Illex* is targeted by the Asian jigging fleet (mainly from Korea, Taiwan and Japan), and also by some trawlers in February-June. The main fishing area lies in the northern and northwestern parts of the FICZ/FOCZ (north of 51-52°S). Fishing effort was relatively stable during 2000-2004 (80-120 jigging vessels). However due to very low abundance of *Illex* in 2004-2005, it gradually decreased to 35-44 vessels in 2008-2009. After three years of high abundance (2006-2008), Illex stocks decreased dramatically in 2009 (similar to situation 2004-2005). In January-February, squid of the South Patagonian stock appeared on the High Seas (45-46ºS). The reported catches of trawlers were variable, from 11 to 60 t per day with the average of 18 t per day). This was about a half of that observed during the same period of 2008 when the abundance of Illex was extremely high (average catches were ~30 t per day). However, something unusual happened with squid migrations in March. Despite similar sea surface temperatures in 2008 and 2009, the South Patagonian squid never appeared to the south of 48-49 ºS. All licensed jigging vessels worked on the High Seas with one-two vessels appearing periodically in FICZ/FOCZ to check the poor fishery situation. As a result, the Illex season was the worst in the whole history for the Falkland fishery, with the meagre 45 t total catch. This Falkland Islands fishery was closed early on 15th May.

SOURCE OF MANAGEMENT ADVICE: The Falkland Islands Fisheries Department (FIFD) is responsible for management advice to the Falkland Islands Government.

PRECAUTIONARY REFERENCE POINTS: In the event that the spawning stock biomass is likely to decline below the Precautionary Reference Point of a minimum of 40,000 t, the fishery should be closed.

STOCK STATUS: The status of the stock is changing every year due to the short life cycle of the squid (1 year). The spawning stock size in 2009 in the FICZ is unknown but the catches of *Illex argentinus* in Argentinian and International waters in 2009 declined by more than 50% compared to 2008 and were the lowest in the last 16 years.

RECENT MANAGEMENT ADVICE: Stock management on the High Seas (international waters of 42°S and 45-47°S) remains one of the main issues for management as there is no regulation at present. To be able to predict the stock status for the following fishing season, joint multilateral studies of *Illex* spawning grounds are needed.

STECF COMMENTS: STECF notes the need for a multilateral approach for the assessment and management of the fisheries in the SW Atlantic through a regional fisheries organization.

6.7. Patagonian squid (*Loligo gahi*), Falkland Islands

FISHERIES: Patagonian squid is the second major fishery resources in the FICZ, and a domestic resource for the Falkland Islands. Loligo is targeted almost exclusively by the Falkland-registered trawlers in the southern and eastern parts of the Falkland Shelf (so-called 'Loligo box'). Fishing effort is stable (16 trawlers). In 2009, the abundance of both cohorts of Loligo was lower than in the last three years possibly due to continuous delays in spawning because of negative anomalies in ambient water temperatures. The first season yielded 12,989 t, and the second season 17,873 t. In-season stock assessment of the escapement biomass (SSB) during the first season was estimated to be 10,500 t, and therefore was close to the 10,000 t escapement limit. During the second season, only one wave of abundance was observed in the first half of August, and then it was gradually depleted by the fishing fleet. After analysis of SSB, the fishing season was closed early on 11th September to preserve the escapement spawning biomass over 10,000 t. Overall, spawning stock biomass during both seasons was close to the minimum threshold limit.

SOURCE OF MANAGEMENT ADVICE: The Falkland Islands Fisheries Department (FIFD) is responsible for management advice to the Falkland Islands Government.

PRECAUTIONARY REFERENCE POINTS: See management advice.

STOCK STATUS: In 2009 the stocks of both cohorts at the end of the fishing season were consistent with the management objective of maintaining an escapement biomass above 10,000 t.

RECENT MANAGEMENT ADVICE: A minimum spawning stock biomass of 10,000 t at the end of each season.

STECF COMMENTS: STECF notes the need for a multilateral approach for the assessment and management of the fisheries in the SW Atlantic through a regional fisheries organization.

6.8. Patagonian toothfish (*Dissostichus eleginoides*), Falkland Islands

FISHERIES: *Dissostichus eleginoides* is the most valuable and highly priced resource in the Falkland Zones. One Falkland company holds exclusive rights to fish for toothfish deeper than 600 m in the Falkland Zones.

SOURCE OF MANAGEMENT ADVICE: The Falkland Islands Fisheries Department (FIFD) is responsible for management advice to the Falkland Islands Government.

PRECAUTIONARY REFERENCE POINTS: Precautionary reference points have not been established for this stock.

STOCK STATUS: The fishery data for 2009 indicated a stabilised toothfish stock abundance at between 42 – 53% virgin SSB (SSB_0).

MANAGEMENT MEASURES: The spawning grounds, on the Burdwood Bank, were closed between 1st July and 31st August from 2007 in order help the stock rebuild by enhancing potential recruitment. Given the decrease in toothfish abundance within FICZ/FOCZ in 2007, it was recommended that the TAC for 2009 remain at 1,200 t.

RECENT MANAGEMENT ADVICE: Stock assessments indicated that the TAC should remain at 1,200 t for 2009 as was the advice for 2007 and 2008.

STECF COMMENTS: STECF notes the need for a multilateral approach for the assessment and management of this stock through a regional fisheries organization. It is unclear if this is a separate stock from Patagonian toothfish in Argentine or Falkland Islands' waters, so efforts to improve stock identification are desirable.

6.9. Hoki (*Macruronus magellanicus*), Argentina[1]

FISHERIES: Hoki is the second main Argentinean finfish species in terms of catches. It is caught by trawlers that process catches on board, and the highest volume is found south of 45ºS. The Federal Fisheries Council established a total TAC of 170,000 t for 2009, whereas 190,000 t was permitted to be fished in 2008. Data from the Argentinean Under-Secretariat for Fisheries reported 67,776 t of hoki landed between 1st January and 1st October 2009, 18% less than landings for the same period in 2008.when 82,760 t were landed.

SOURCE OF MANAGEMENT ADVICE: The Instituto Nacional de Investigación y Desarrollo Pesquero (INIDEP, National Institute for Research and Fisheries Development) is the organisation responsible to give the necessary scientific support for the rational exploitation of the resources and to avoid over fishing.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed.

STOCK STATUS: STECF notes that the total estimated biomass made by the Argentinean National Institute for Fisheries research and development (INIDEP) was of 1.2 million t at the beginning of 2008.

RECENT MANAGEMENT ADVICE: STECF did not have access to management advice for this stock

STECF COMMENTS: STECF notes the need for a multilateral approach for the assessment and management of the fisheries in the SW Atlantic through a regional fisheries organization. It is not clear if hoki in the Argentinean EEZ constitutes a separate stock from hoki in the Falkland Islands' zone and/or in International waters. Efforts to improve stock identification are desirable.

6.10. Patagonian grenadier (*Macrourus carinatus, Macrourus holotrachys*), Argentina

FISHERIES: STECF did not have access to any information on fisheries for Patagonian grenadier in Argentinean waters.

SOURCE OF MANAGEMENT ADVICE: The Instituto Nacional de Investigación y Desarrollo Pesquero (INIDEP, National Institute for Research and Fisheries Development) is the organisation responsible to give the necessary scientific support for the rational exploitation of the resources and to avoid over fishing.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed.

STOCK STATUS: STECF did not have access to any stock assessment in this area.

RECENT MANAGEMENT ADVICE: STECF did not have access to management advice for this stock

STECF COMMENTS: STECF notes the need for a multilateral approach for the assessment and management of the fisheries in the SW Atlantic.

6.11. Southern blue-whiting (*Micromesistius australis australis*), Argentina

FISHERIES: The abundance of southern blue whiting in Argentine waters declined in 2005, after having been stable prior to 2001 and increasing since that time. Since 2001, annual catches have been on average around 45,000 t, but in 2005, the landings of this species totalled 34,735 t. The same declining situation seems to have continued in 2006, according to official statistics. The SAGP&A figures indicate that between January and December 2007, 18,982t of southern blue whiting were landed, 39.3 % less than in 2006 (31,286 t). Between 1st January and 31st December 2008, 18.996t of southern blue whiting were landed according to SAGP&A statistics. 13,118 t of southern blue whiting were landed in the first nine months of 2009, 9,8% more than in the same period 2008.

SOURCE OF MANAGEMENT ADVICE: INIDEP is the main advisory body.

[1]Information for Section 6 was collected through the Internet from several official organisations such as SAGP&A, DNPyA, CFP, INIDEP, etc, as well from specialized fisheries magazines (FIS and Pescare).

PRECAUTIONARY REFERENCE POINTS: $F_{30\%}$=0.20 and $F_{0.1}$= 0.14 were established by INIDEP in 2001as biological reference points for southern blue whiting.

STOCK STATUS: Mean annual CPUE values for the Argentinean surimi fleet between 1992-2007 indicated a declining trend in abundance throughout the whole period. For the period 1987-2207, biomass declined up to 2002 and has remained relatively stable in recent years. Total biomass at the beginning of 2007 was estimated at around 560,000 t and SSB was estimated to be 468,000 t. The actual exploitation rate was estimated at F=0.51, similar to that of 2006 when catches were also similar.

RECENT MANAGEMENT ADVICE: A TAC of 60,000 t was recommended by INIDEP for 2009.

STECF COMMENTS: STECF notes the need for a multilateral approach for the assessment and management of the fisheries in the SW Atlantic through a regional fisheries organization. It is not clear if southern blue whiting in Argentinean waters constitutes a separate stock from those fish in Falklands' and/or International waters, so efforts to improve stock identification are desirable.

6.12. Red cod (*Salilota australis)*, Argentina

FISHERIES: Red cod is caught inside Argentinean waters by bottom trawlers and by artisanal fleets. Red cod landings, increased from 1990, reaching a maximum of 14,900 t in 1998. Most of the catches (85%) were obtained by the fleet operating around the Falkland/Malvinas Islands. The main fishing grounds were located to the SW of the islands during the spawning season (September-October).

According to data from SAGP&A, total landings of red cod by all fleets (artisanal, bottom trawlers, longliners, etc) in Argentinean ports in 2008 amounted to 8,010 t, representing almost twice the reported landings in 2007 (4,611 t) and almost four times the reported landings in 2006 (2,427 t). From the 1st of January until the 15th of October 2009, a total of 5032 t of red cod were landed, a figure very similar to that for the same period in 2008 (5,484 t).

SOURCE OF MANAGEMENT ADVICE: INIDEP is the main advisory body.

PRECAUTIONARY REFERENCE POINTS: Unknown

STOCK STATUS: Stock status is unknown

RECENT MANAGEMENT ADVICE: Considering the mean biomass estimates during the 1992-1998 period, taking F_{safe} as an objective would imply allowing a maximum catch of 14,200 annual t in the area where the Argentine fleet operates. A TAC of 5,000 t was set by the Federal Fisheries Council (CFP) for 2005. No updated information is available on this subject.

STECF COMMENTS: STECF notes the need for a multilateral approach for the assessment and management of the fisheries in the SW Atlantic through a regional fisheries organization. It is not clear if red cod in Argentinean waters constitutes a separate stock from those fish in Falklands' and/or International waters, so efforts to improve stock identification are desirable.

STECF notes the increase of officially reported landings between 2006 and 2008 (2,427 t in 2006, against 8,010 t in 2008).

6.13. Argentine hake (*Merluccius hubbsi*), Argentina

FISHERIES: Argentine hake is targeted inside Argentinean waters by bottom trawlers and by artisanal vessels using different fishing gears. Important amounts of juveniles are discarded in the shrimp fisheries carried out by trawlers around San Matias Gulf.

Data from the Argentinean under Secretariat for Fisheries reported 263,323 t of Argentine hake landed in 2008, against 299,605 t in 2007 and 353,423 in 2006. Between the first of January and the 15th of October 2009, 198,263 t were landed: a similar figure to that in 2008 during the corresponding period (208,729). Of total landings of hake in 2009, 160,027 t related to the Southern stock and 38,234 t to the Northern stock.

SOURCE OF MANAGEMENT ADVICE: INIDEP is the main advisory body.

PRECAUTIONARY REFERENCE POINTS: A SSB of 130,000 t for 2008 was proposed by INIDEP for the hake stock north of 41º S[2]. Due to the large decrease in population abundance and to low recruitments in recent years indicating the possibility of recruitment overfishing, it was advised that catches in 2008 ranged from 41,000 t to 48,000 t with the aim of achieving recovery of SSB to levels between 130,000 t - 200,000 t in the short-medium term according to the following table:

Objective	SSB > 130.000 t		SSB > 200.000 t	
	F	TAC 2008 (t)	F	TAC 2008 (t)
Short term	0,336	40.939	0,121	15.915
Medium term	0,525	59.332	0,407	48.119

STOCK STATUS: Assessment of the status of the stock north of 41º S between 1986 and 2007, made by INIDEP in 2008[3] revealed a higher presence of age-group 2 since 2002. In 2005 70% of the catch was composed by age-group 2, whilst in 2006 and 2007 most of the catch was due to age group 3, followed by age-groups 2 and 4. Recruitments in 2005 and 2006 were the lowest of the historical series. SSB is estimated to be well below the precautionary reference point for this stock (130,000 t). The estimated abundance of mature hake in 2008 was the lowest observed for the period 2005- 2008, (INIDEP Technical Report 18/08 (precursor to 243/08).

The results of the juvenile common hake survey carried out in January by the National Institute for Fisheries Research and Development (INIDEP) show that the three-year decline registered from 2005 to 2008 within the north Patagonian breeding ground has reversed somewhat. CPUE, as much in weight as in number of fish, has doubled since last year. Nonetheless, both figures are still well below those observed in 2005, thus the general state of the resource is still critical.

MANAGEMENT MEASURES: Several closed areas and/or seasons have been implemented in recent years by Argentinean authorities. Some of the protected areas are the nursery grounds around Isla Escondida and the shrimp fishing area around San Matias Gulf. Different Conservation measures are in force to the north and south of parallel 41º S respectively.

The permanently banned area of argentine hake has recently been extended to include the northern half of the 4160, 4260, 4261 and 4262 quadrants, as announced by the Secretariat of Agriculture, Livestock, Fisheries, and Food (SAGP&A). The measure had been recommended in April by the National Institute for Fisheries Research and Development (INIDEP), after evaluating hake juvenile numbers in the area. The goal is to strengthen non-adult hake conservation measures, including protection of recent spawners and one year-olds.

RECENT MANAGEMENT ADVICE:

The Argentine Fisheries and Aquaculture Subsecretariat (SSP&A) will allow fishing to take place in an area located inside the permanent closed hake zone, after a weaker presence of juveniles was detected in the zone. Under a precautionary approach, INIDEP also recommended the preventative closure of the statistical quadrant located between parallels 47° and 48° South and Meridians 64° and 65° West. The initiative follows a similar one that took place in March 2009, when CFP determined that it was convenient to open north statistical quadrant 4160 and close southern quadrant 4764.

A system of individual transferable quotas (ITQs) for common hake (*Merluccius hubbsi*) will come into effect as of January 2010 and will be in place for 15 years.

STECF COMMENTS: STECF notes the need for a multilateral approach for the assessment and management of the fisheries in the SW Atlantic through a regional fisheries organization. It is not clear if hake in Argentinean waters constitutes a separate stock from those fish in Falklands' and/or International waters, so efforts to improve stock identification are desirable.

6.14. Argentine short-finned squid (*Illex argentinus*), Argentina

FISHERIES: *Illex argentinus* is the major Argentine cephalopod fishery resource. Artisanal vessels have exploited the species in Argentinean waters since 1946. Up to 1977 catches were taken as by-catch in the trawl

[2] Inf. Téc. INIDEP N° 32.
[3] Op. Cit.

fishery for hake. Then, trawler catches increased reaching 59,000 t in 1978. From 1993 a target fishery was developed with the incorporation of domestic (41) and chartered (45) jigging boats, which increased the catches to 204,730 t that year. Total catches ranged between 377,150 t in 1997 and 127,386 t in 2003. In the whole period, total number of jigging boats varied between 65 and 150. The Argentinean under Secretariat for Fisheries reported 233,068 t of Illex squid landed in 2007 against the 291,916 t landed in 2006, representing a reduction of about 20%. During 2008, 255,531tonnes of Illex were landed in Argentine maritime ports (SAGP&A), an increase compared to 2007.

In 2009, the Illex squid season within the Argentinean EEZ closed with one of the worst registries in the history. Official statistics by SAGP&A reveal that 65,610 t of Argentine short-finned squid were landed from 1 January to 4 September, a fall of 75.7% in relation to the 251,893 t landed in the same period 2008. The squid jigger fleet landed 50,700 t of squid; fresh fish vessels, 5,353 t; while 5,081 t were unloaded by trawlers, among other vessels.

The future forecast is also worrisome because scientists lack sufficient data to project the evolution of the resource. To date, the expeditions for the evaluation of the North-Patagonic Buenos Aires Stock and for the estimation of indices of juvenile abundance of the Spring Spawning Stock were not undertaken.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is the Instituto Nacional de Investigación y Desarrollo Pesquero (INIDEP), together with input from Comisión Técnica Mixta del Frente Marítimo (CTMFM) for the Common Fishing Zone of Argentina and Uruguay (north management area) and the South Atlantic Fisheries Commission (SAFC) for the south management area.

MANAGEMENT MEASURES: Prior to 1995 management measures were agreed between the UK and Argentinian autorities. However, talks broke down in 2005 and since that time, there have been no jointly agreed management decisions.

With the introduction of the 25 year licencing system introduced in 2005, the previously agreed management measure of allowing 40% SSB escapement is also no longer in place.

PRECAUTIONARY REFERENCE POINTS: STECF is unaware of any currently agreed precautionary reference points for the management of the stock in Argentinean waters.

STOCK STATUS: During a cruise carried out by INIDEP in February 2005 for assessment of *Illex* pre-recruits, mean density in the total survey area of (2.18 t/nm$^{2.}$) was higher than that observed in 2004 (1.15 t/nm^2). Observed mean density south of 48º S (0.90 t/nm^2) was also higher than in 2004 (0.19 t/nm^2). Mean density north of 48º S was 3.77 t/nm^2. Total pre-recruit estimates (121,355 t, +/- 39,081 t and 468 million individuals) indicate an increase in biomass and number with respect to 2004, but remained lower than the 1995 estimate, which was previously the lowest on record.

As with other short-lived species, annual fluctuations of the abundance of the Argentine short-finned squid stocks were observed in the period 1993-2003. A recruitment failure in the South Patagonian and Bonaerense North Patagonian Stocks (SPS and BNPS respectively) in 2004 resulted in a collapse of the fishery. As a result, Summer Spawning Stock (SSS) accounted for most of the Argentine catches in 2004 (70,000 t).

Current stock status is unknown to STECF.

A report by INIDEP[4] on the status of the fishery for 2008 (in press) indicate recruitment estimations of 683,838 t for the SPS stock at the start of the fishery (week 1) and a escapement of 22.95 % (183,303 t) for week 24. Recruitment estimations for the BNPS stock at the start of the fishery (week 19) were 171,201 t and an escape of 34.12 % (25,797 t) for week 36.

MANAGEMENT MEASURES: A ban on squid (*Illex argentinus*) fishing for all types of vessels for the area south of parallel 44° 30' south was decided upon by the Argentine Under Secretariat of Fisheries and Aquaculture (SSP&A), as of 11 April 2005. The Federal Fisheries Council (CFP) asked the Enforcement Authority to proceed with the closure of the squid (*Illex argentinus*) fishery south of parallel 42º 15' S as of 28 May 2005. Another ban north of 39º 40' S was decided by CFP to be enforced as of 27 June 2005. No new management measures are known by the STECF.

RECENT MANAGEMENT ADVICE: STECF is unaware of any recent management advice for *Illex argentinus* in Argentinean waters.

[4] Illex argentinus. Pesquería 2008 (in press)

STECF COMMENTS: STECF notes the need for a multilateral approach for the assessment and management of the fisheries in the SW Atlantic through a regional fisheries organization. It is not clear if *Illex argentinus* in Argentinean waters constitutes a separate stock from A. argentinus in Falklands' and/or International waters, so efforts to improve stock identification are desirable.

6.15. Patagonian squid (*Loligo gahi*), Argentina

FISHERIES: *Loligo gahi* abundance is lower inside the Argentine EEZ than in other areas, some quantities are caught as a by-catch by bottom trawlers in the finfish fisheries and perhaps by artisanal fleets. Total landings of Patagonian squid by all fleets (artisanal, bottom trawlers, longliners, etc) in Argentinean ports were 238 t during 2007, 234 t in 2008 and 85 t in 2009 up to 15th October.

SOURCE OF MANAGEMENT ADVICE: INIDEP is the organisation responsible to give the necessary scientific support for the rational exploitation of the resources and to avoid over fishing.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed.

STOCK STATUS: STECF did not have access to any stock assessment in this area.

RECENT MANAGEMENT ADVICE: Unknown.

STECF COMMENTS: STECF notes the need for a multilateral approach for the assessment and management of the fisheries in the SW Atlantic through a regional fisheries organization. It is not clear if *Loligo gahii* in Argentinian waters constitutes a separate stock from those fish in Falklands' and/or International waters, so efforts to improve stock identification are desirable.

6.16. Patagonian toothfish (*Dissostichus eleginoides*), Argentina

FISHERIES: Patagonian toothfish in Argentine waters is fished by trawlers and longliners. SAGP&A figures for 2008 indicate that 2,159t of Patagonian toothfish were landed, an increase of about 15% in relation to 2007 (1,846 t). Up to the 1st of October 2009, landings of toothfish by Argentinean vessels were 1,051 t, 36% less than the 1,648 t landed in the same period in the previous year (2008).

SOURCE OF MANAGEMENT ADVICE: INIDEP is the organisation responsible to give the necessary scientific support for the rational exploitation of the resources and to avoid over fishing

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed.

STOCK STATUS: A recent report by INIDEP (2007)[5] concluded that the state of the fishery for Patagonian toothfish in the Argentinean waters continues its trend toward a more favourable situation due to the strategies implemented by management, particularly since 2003. In 2009, the Federal Fisheries Council indicated that fishery of Patagonian toothfish "shows a trend towards stability and the existence of some positive signs, like the low portion of juvenile specimens present in the catch."

RECENT MANAGEMENT ADVICE: A TAC of 2,500 t was set by the Federal Fisheries Council (CFP) for 2009, the same than in 2008. The TAC established is based on criteria for prevention, and was agreed on after evaluating the technical report drafted by the National Institute of Fisheries Research and Development (INIDEP) on the state of the resource.

STECF COMMENTS: STECF notes the need for a multilateral approach for the assessment and management of the fisheries in the SW Atlantic through a regional fisheries organization. It is not clear if Patagonian toothfish in Argentinian waters constitutes a separate stock from those fish in Falklands' and/or International waters, so efforts to improve stock identification are desirable.

6.17. Patagonian shrimp (*Pleoticus muelleri*), Argentina

FISHERIES: Patagonian shrimp is fished by beam trawlers operating in the Gulf of San Jorge waters under a license regime by the Federal Fisheries Council (CFP). In 2007 47,623 t of shrimp were landed into Argentinean ports, a similar figure to that for 2006 (44,410 t). Landings in 2008 were 47,406 t.

[5] INIDEP Inf. Téc. INIDEP N° 4. 27-12-07. 9 pp.

Usually, most of the catches are taken by the freezer trawler fleet (37,000 in 2008 representing 92% of the total catch).

The Secretariat of Agriculture, Livestock, Fisheries, and Food (SAGP&A) reported that a total of 45,134 t of shrimp (*Pleoticus muelleri*) were landed between 1st January and 15th October 2009. This volume represents an increase of 9.7% in terms of the 41,111 t landed in the same period of 2008. At any rate, landings have been falling from 1 August to 15 October 2009.

Patagonian shrimp catches (1989-2008)

Year	Tons	Year	*Tons*
1989	11,353	2000	37,150
1990	9,648	2001	78,798
1991	8,337	2002	51,389
1992	24,495	2003	52,896
1993	19,271	2004	27,030
1994	16,670	2005	7,470
1995	6,203	2006	44,410
1996	9,874	2007	47,623
1997	6,482	2008	47,406
1998	23,333	2009	45,133*
1999	15,988		

* Provisional data (01/01/2009-15/10/2009)

SOURCE OF MANAGEMENT ADVICE: INIDEP is the organisation responsible to give the necessary scientific support for the rational exploitation of the resources and to avoid overfishing.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed.

STOCK STATUS: Unknown.

MANAGEMENT MEASURES: A closure of the fishery was put in force by mid October 2008 in the area contained by the parallels 42º-47º S, the meridian 62º W and the line of national jurisdiction.

The Federal Fisheries Council (CFP) decided to close the zone located between parallels 44º and 45°, in national jurisdictional waters. The measure, which entered into force on the 17th October 2009, obeys the fact that the breeding of common hake (*Merluccius hubbsi*), a species that is usually captured incidentally, begins in that zone at this time of year.

RECENT MANAGEMENT ADVICE: Unknown.

STECF COMMENTS: STECF notes the need for a multilateral approach for the assessment and management of the fisheries in the SW Atlantic through a regional fisheries organization.

6.18. Kingclip (*Genypterus blacodes*), Argentina

FISHERIES: Kingclip is one of the most important demersal fishes in Argentine waters. It is found between 35° and 55°S, reaching high concentrations in summer between 42° and 48°S. In winter, schools disperse over the whole range of distribution. The Argentine kingclip fishery started developing in 1986 when catches surpassed 15,000 t/year. Landings have been stable in recent years at around 23,000 t/year up to 2005. Landings in 2006, 2007 and 2008 were 20,551 t, 20,581 t and 17,559 t respectively. Preliminary data on landings by SAGP&A reported 13,902 t between 1st January and 15th October 2009. Approximately 50% of the total catch of kingclip is caught as by-catch by bottom trawlers that direct their effort to hake (*Merluccius hubbsi*).

SOURCE OF MANAGEMENT ADVICE: INIDEP is the organisation responsible to give the necessary scientific support for the rational exploitation of the resources and to avoid over fishing.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed.

– **STOCK STATUS:** Not precisely known

MANAGEMENT MEASURES: A TAC of 16,000 t of kingclip was established by the Federal Fisheries Council of Argentina (CFP) for 2008.

RECENT MANAGEMENT ADVICE: Unknown.

STECF COMMENT: STECF notes the need for a multilateral approach for the assessment and management of the fisheries in the SW Atlantic through a regional fisheries organisation.

6.19. Hoki (*Macruronus magellanicus*), International waters

Information on biomass of the species presented in sections 6.19 to 6.25 was extracted from the reports of the two research cruises for assessment of fishery resources on the High Seas of the SW Atlantic carried out by the IEO between 10th of March -18th April 2008 and between 24th of February-1st April 2009 (del Río *et al*., 2008 and 2009). It is expected that the historical series of fisheries research cruises started by IEO in 2008 and continued in 2009 could provide useful information on the stock status in the coming years.

FISHERIES: Hoki is fished as a by catch during *Illex* and hake fisheries by bottom trawlers from several countries, mainly Spain.

SOURCE OF MANAGEMENT ADVICE: No management advisory body exists for International waters of the Patagonian Shelf.

PRECAUTIONARY REFERENCE POINTS: Precautionary reference points have not been defined for this stock.

STOCK STATUS: The swept area biomass estimates for this stock in 2008 and 2009 were 13,792 t and 8,497 t respectively, representing a decline of 39% in 2009 compared to the previous year. Biomass was observed to be highest at depths between 401 and 700 m in both years.

RECENT MANAGEMENT ADVICE: At present there is no management of the fisheries exploiting *Macruronus magellanicus* in International waters of the Southwest Atlantic.

STECF COMMENTS: STECF notes the need for a multilateral approach for the assessment and management of this stock through a regional fisheries organization. It is unclear if this is a separate stock from hoki in Argentine or Falkland Islands waters, so effort should be made to improve stock identification.

6.20. Patagonian grenadier (*Macrourus carinatus, Macrourus holotrachys*), International waters

FISHERIES: Commercial catches of *Macrourus carinatus and Macrourus holotrachys* are negligible in the area where the fisheries take place in international waters (<300 m depth). Results from the two mentioned research surveys carried out by IEO indicate that despite being the most abundant species in the study area, Patagonian grenadier (*Macrourus carinatus*) is mainly distributed between 500-1000 m depth, far beyond the depth range in which the fleet operates (98% of the commercial hauls at less than 300 m depth). Similarly, *Macrourus holotrachys* has its highest densities between 1001-1500 m depth.

SOURCE OF MANAGEMENT ADVICE: No management advisory body exists for International waters of the Patagonian Shelf.

PRECAUTIONARY REFERENCE POINTS: Precautionary reference points have not been defined for this stock.

STOCK STATUS: The only estimates of stock biomass are those derived from the two research surveys undertaken by the IEO in March-April 2008 and February-March 2009. *Macrourus carinatus* was found to be the most abundant species during both research cruises with an estimated swept area biomass of 116,679 t in 2008 and 212,768 t in 2009. This represented an increase of about 82% in 2009 with respect to 2008. *Macrourus carinatus* is distributed between 200 and 1500 m, but with the highes catches between 501 and 1000 m depth. In terms of abundance, *Macrourus holotrachys* was the seventh largest stock among the 12 assessed commercial species, with an estimated biomass of 4,178 t and 5,479 t in 2008 and 2009 respectively. The highest catches were taken between 1001-1500 m depth in both years.

RECENT MANAGEMENT ADVICE: At present there is no management of the fisheries exploiting *Macrourus carinatus* and *Macrourus holotrachys* in International waters of the Southwest Atlantic.

STECF COMMENTS: STECF notes the need for a multilateral approach for the assessment and management of this stock through a regional fisheries organization. It is unclear if this is a separate stock from Patagonian grenadier in Argentine or Falklands waters, so efforts to improve stock identification are desirable.

6.21. Southern blue-whiting (*Micromesistius australis*), International waters

FISHERIES: Southern blue whiting is fished as by catch during *Illex* and hake fisheries by bottom trawlers from several countries, mainly from Spain.

SOURCE OF MANAGEMENT ADVICE: No management advisory body exists for International waters of the Patagonian Shelf.

PRECAUTIONARY REFERENCE POINTS: Precautionary reference points have not been defined for this stock.

STOCK STATUS: biomass estimates from the aforementioned IEO surveys gave biomass estimates for 2008 and 2009 of 858 t and 710 t of southern blue whiting, distributed between 300 and 700 m, but with most of the catches obtained at 501-700 m depth.

RECENT MANAGEMENT ADVICE: At present there is no management of the fisheries exploiting *Micromesistius australis* in International waters of the Southwest Atlantic.

STECF COMMENTS: STECF notes the need for a multilateral approach for the assessment and management of this stock through a regional fisheries organization. It is unclear if this is a separate stock from southern blue whiting in Argentine or Falkland Islands waters, so efforts to improve stock identification are desirable.

6.22. Red cod (*Salilota australis)*, International waters

FISHERIES: Red cod is caught as by-catch in hake and *Illex* squid fisheries by bottom trawlers from several countries, mainly from Spain.

SOURCE OF MANAGEMENT ADVICE: No management advisory body exists for International waters of the Patagonian Shelf.

PRECAUTIONARY REFERENCE POINTS: Precautionary reference points have not been defined for this stock.

STOCK STATUS: A biomass of 118 t (2008) and 163 t (2009) of red cod was estimated during the IEO cruises in 2008 and 2009.

RECENT MANAGEMENT ADVICE: At present there is no management of the fisheries exploiting *Salilota australis* in International waters of the Southwest Atlantic.

STECF COMMENTS: STECF notes the need for a multilateral approach for the assessment and management of this stock through a regional fisheries organization. It is unclear if this is a separate stock from red cod in Argentine or Falkland Islands waters, so efforts to improve stock identification are desirable.

6.23. Argentine hake, Austral hake (*Merluccius hubbsi, Merluccius australis*), International waters

FISHERIES: Argentine hake is targeted by bottom trawlers from several countries, mostly Spain. International waters are the most important area for Spanish trawlers targeting for hake in the SW Atlantic. The highest catches for this fleet in the Patagonian Shelf were observed in 1990 with more than 100,000 t, corresponding most of them to the High Seas. The main fishing grounds for *M. hubbsi* are located between parallels 44-48º S. Relatively low catches of the order of 50 t annually of *M australis* have been reported from this area.

The maximum effort in terms of numbers of vessels in International waters and Falkland Islands by Spanish vessels was reported in 1990 (c. 100 vessels) and has decreased since then, mainly due to the development of new fisheries in other areas (i.e the North West Atlantic, NAFO fisheries). Currently, the number of fishing units flagged to Spain operating in this area is around 27 vessels.

SOURCE OF MANAGEMENT ADVICE: No management advisory body exists for International waters of the Patagonian Shelf.

PRECAUTIONARY REFERENCE POINTS: Precautionary reference points have not been defined for this stock.

STOCK STATUS: The swept area biomass estimates for Argentine hake from both surveys were 15,877 t (2008) and 18,512 t (2009), with highest biomass below 200 m depth. No specimens of *M. hubbsi* were taken at depths greater than 300 m. The bathymetric distribution of this species was very similar during both cruises.

Austral hake was the least abundant commercial species in the cruise of 2008, with an estimated swept area biomass of only 48 t. The 2009 estimate was 206 t.

RECENT MANAGEMENT ADVICE: At present there is no management of the fisheries exploiting *Merluccius hubbsi* and *Merluccius australis* in International waters of the Southwest Atlantic.

STECF COMMENTS: STECF notes the need for a multilateral approach for the assessment and management of this stock through a regional fisheries organization. It is unclear if hakes in international waters constitute separate stocks from those in Argentine or Falkland Islands' waters, so efforts to improve stock identification are desirable.

6.24. Argentine short-finned squid (*Illex argentinus*), International waters

FISHERIES: The Argentine short-finned squid (*Illex argentinus*) is a common neritic species occurring in waters off Brazil, Uruguay, Argentina, the Falkland/Malvinas Islands and on the High Seas in the southwest Atlantic. *Illex* is the most important cephalopod species in the area and plays a significant role in the ecosystem. It is the target of major fisheries using both trawlers and jigging vessels during the first half of the year. Bottom trawlers are mainly from Spain, whereas jiggers belong to several Asian countries such as Japan, Korea and Taiwan. The main fishing area on the High Seas is between parallels 44-47º S.

Concentrations of short-finned squid are found 45-46º S in January or February and the animals gradually migrate southward towards the Falkland Islands while growing rapidly. Peak concentrations are found around the Falkland Islands between March and May. Towards the end of this period, animals start migrating northward to spawn and die around July or August.

Since the early 1980s, Argentine short-finned squid have been caught by Spanish bottom trawlers as by-catch in the hake fishery. Currently, this squid species is considered as one of the target species for the Spanish fleet operating in the Southwest Atlantic, with mean annual catches of about 35,000 t. As an annual species, its catches fluctuate markedly from year to year depending on environmental conditions.

SOURCE OF MANAGEMENT ADVICE: No management advisory body exists for International waters of the Patagonian Shelf.

PRECAUTIONARY REFERENCE POINTS: Precautionary reference points have not been defined for this stock.

STOCK STATUS:. The swept area biomass estimates for Argentine short-finned squid from the IEO surveys was 45,073 t in 2008 and 22,149 t in 2009 (around 50% less).

RECENT MANAGEMENT ADVICE: At present there is no management of the fisheries exploiting *Illex argentinus* in International waters of the Southwest Atlantic.

STECF COMMENTS: STECF notes the need for a multilateral approach for the assessment and management of this stock through a regional fisheries organization. It is unclear if this is a separate stock from Illex argentinus in Argentine or Falkland Islands' waters stocks, so efforts to improve stock identification are desirable.

6.25. Patagonian squid (*Loligo gahi*), International waters

FISHERIES: *Loligo gahi* is caught in relatively small quantities as by-catch by bottom trawlers during hake and *Illex* fisheries. The main fishing area is around parallel 42º S, where big catches of mainly juvenile Patagonian squid have been reported in different years by observers on board of Spanish vessels.

SOURCE OF MANAGEMENT ADVICE: No management advisory body exists for International waters of the Patagonian Shelf.

PRECAUTIONARY REFERENCE POINTS: Precautionary reference points have not been defined for this stock.

STOCK STATUS: The study area of the IEO research cruises aimed at the measurement of commercial stocks did not cover the main commercial fishing area for this species, i.e. around parallel 42º S. The swept area biomass estimates for *L. gahi* in 2008 and 2009 were 2,108 t and 1,867 t respectively. Spatial distribution of this species was similar in both cruises, with the highest estimates at depths less than 200 m and south of parallel 46º S.

RECENT MANAGEMENT ADVICE: At present there is no management of the fisheries exploiting *Loligo gahi* in International waters of the Southwest Atlantic.

STECF COMMENTS: STECF notes the need for a multilateral approach for the assessment and management of this stock through a regional fisheries organization. It is unclear if this is a separate stock from Argentine or Falklands stocks, so effort should be made to improve stock identification.

7. Resources in the Mediterranean Sea (GFCM)

The Management advisory body is the Scientific Advisory Committee (SAC) of the General Fisheries Commission for the Mediterranean (GFCM). The SAC is organised in Sub-Committees. The Sub-Committee on Stock Assessment (SCSA) gives advice on stock status.

One of the objectives of the GFCM SCSA, is to enhance of joint practical stock assessment involving the participation of scientists from different Geographical Sub-Areas (GSAs) who provide their data and share them with their colleagues, using standard methodologies and analyzing together the results and options for fisheries management. The process, based on undertaking joint practical session to assess in particular the stocks of hake and associated species, was launched in 2008, during the SCSA Working Group on Demersal species (Turkey, September 2008). The assessments were carried out using both commercial catches and trawl survey data.

During its thirty-third session, the Commission endorsed the proposal of the Scientific Advisory Committee (SAC) aimed to reconsider the functioning of the Workings Groups on Stock Assessment of demersal and small pelagic species. Under this new vision, in 2009 the SCSA Working Group on demersal species would carry out its work into four thematic sub-groups (crustaceans, hake, mullets and other species). The Working Group on small pelagic species carried out its work on sardine and anchovy according the SAC proposal. In both cases the work will deal exclusively with practical stock assessments using standard methodologies.

The outcome of the assessments already undertaken by national experts within the data collection national programmes, FAO Regional projects and/or other international initiatives should be be presented directly to the SCSA meeting for review.

With the aim of establishing the scientific evidence required to support development of long-term management plans for selected fisheries in the Mediterranean, consistent with the objectives of the Common Fisheries Policy, and to strengthen the Community's scientific input to the work of GFCM, the Commission made a number of requests to STECF. In order to meet these requests, a series of STECF SubGroups on the Mediterranean were initiated in 2008 (SGMED Working Group). In 2009 SGMED-09-02 Working Group on the Mediterranean Part I took place at Villasimius, Sardinia, (Italy) in June 2009. The SGMED-09-03 Assessment of Mediterranean stocks – Part II will be held in December 2009 at Barza d'Ispra (Italy). They will produce short and medium term projections regarding the assessments discussed in the previous meeting.

The GFCM Working Groups on the Demersal Stocks and on the Small Pelagic Stocks were held at Ancona (Italy) in October 2009, from 19 to 23 and from 26 to 30 respectively, that is in the same days and just after the STECF SGECA RST 09 03. The GFCM SCSA will take place at Malaga in November. Consequently, the update of the Mediterranean stocks was done on the basis of the assessments presented at the SGMED 09 02 Working Group.

Only eighteen updated stock assessments were available from the SGMED 09-02 Working Group. Six of them regarded small pelagic fish (sardine and anchovy) in three Geographical Sub-Areas (GSAs 16, 17, and 22). Twelve assessments dealt on demersal stocks covering eight GSAs (06, 09, 10, 11, 15, 16, 17, and 25) and seven species.

STECF appreciates the efforts made by GFCM and SGMED in the recent years to harmonize the assessment of the most important stocks among the different Mediterranean countries but notes that, in spite of this, most of the Mediterranean stocks are not yet assessed on a regular basis in all GSAs.

STECF recommends that Member States should present assessments for all the stocks included in the regulations 1639/2001 and 1581/2004 for each GFCM sub-area under European Community jurisdiction.

STECF notes that the cooperation between Member States, GFCM and SGMED should be further improved in order to provide annual assessment of all stocks listed in the regulations 1639/2001 and 1581/2004, taking into account that national programmes for data collection are in force.

Finally, STECF suggests that in the next years there will be a better coordination between GFCM-SCSA, SGMED and SGECA Working Groups so that the SGECA WG will be able to review all the updated stock assessments and advices that will be presented for the Mediterranean Sea.

7.1. European anchovy (*Engraulis encrasicolus)* in Geographical Sub Area 1. Northern Alboran Sea

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: The purse seine fleet operating in GSA 01 Northern Alboran Sea is composed by 136 units, characterised by small vessels. 22% of them are smaller than 12 m, 78% between 12 and 24 m. The fleet has been continuously decreasing since eighties, from more than 230 vessels in 1980 to 136 in 2007.

Anchovy and Sardine *(Sardina pilchardus)* are the main target species of the purse seine fleet in Northern Alboran GSA01, but other species with lower economical importance are also captured, sometimes representing a high percentage of the capture: horse mackerel (*Trachurus spp.*), mackerel (*Scomber spp.*) and gilt sardine *(Sardinella aurita).*

Anchovy is the species with the highest economical value. The annual landings of anchovy for the last eighteen years ranged between 200 and 3000 tons. During the period from 1990-2007, the catches of anchovy stock in the Alborán Sea showed marked fluctuations. A successful recruitment, estimated by echo-acoustic tracking, was observed during 2001 in the Alborán Sea producing a strong increment of landings in 2002. Nevertheless, the catch dropped in 2003, continuing at low level to 2007. Málaga Bay is the most important recruitment and fishery area. Only this area, which represents 85% of total landings, has been considered.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is GFCM-SAC. Biomass estimation comes from acoustic surveys and from commercial landings and CPUEs. Nevertheless, no acoustic survey was performed in 2007, so management advice was based on landings and CPUEs.

From 2008 advice is provide also by SGMED.

PRECAUTIONARY REFERENCE POINTS: No reference points have been defined for this stock.

STOCK STATUS: GFCM-SAC estimated low levels of biomass, recruitment and catch from 2003 to 2006. Low catches in 2007. However, there is some uncertainty about the status of the stock.

SGMED estimated that both total biomass in 2007 (TB=633 t) and Spawning Stock Biomass in 2007 (SSB=378 t) are the lowest of the series 2002-2007, continuing with the decreasing trend observed since 2004. Recruitment levels in 2006 and 2007 are the lowest of the time series (R06=48 millions and R07=54 millions). Since 2002 fishing mortality (F0-2) has varied between 3.9 and 0.6. The maximum was observed in 2002, then falling down to the minimum in 2003. Since then, F shows an increasing trend (F07=1.82).

RECENT MANAGEMENT ADVICE: Fishing effort should be reduced, unless there is an increase in recruitment evident from the 2008 autumn acoustic survey. It should be noted that small pelagic fishery in GSA 01 is multispecies and effort on sardine and anchovy should be considered together. According to SGMED recent assessment (2008) fishing mortality should be reduced in order to allow future recruitment contributing to stock recovery. This requires consideration of the mixed fisheries nature of the fleets.

STECF COMMENTS: STECF agrees with the advice of the GFCM-SAC Sub-Committee on Stock Assessment (SCSA) and with SGMED. STECF recommends to carry out acoustic survey each year and to examine the introduction of closed areas and/or seasons in order to protect recruits or spawning stock.

7.2. European anchovy *(Engraulis encrasicolus)* in Geographical Sub Area 3. Southern Alboran Sea

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: The purse seine fleet operating in GSA 03 Southern Alboran Sea is composed of about 150 boats distributed in seven Mediterranean ports.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is GFCM-SAC. Data sources were acoustic surveys and landings.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: No assessment has been presented to SAC-GFCM Sub-Committee in 2008.

The biomass estimate obtained by the acoustic survey performed in May 2006 is 3700 tons.

RECENT MANAGEMENT ADVICE: No specific advice is given by the GFCM-SAC Sub-Committee on Stock Assessment (SCSA).

STECF COMMENTS: STECF notes that the information presented on this stock and fishery is poor and in the absence of any reliable biological reference points, is unable to assess the status of the resource or its exploitation rate. Consequently, STECF is unable to advise on an appropriate exploitation rate for this stock.

7.3. European anchovy (*Engraulis encrasicolus)* in Geographical Sub area 6. Northern Spain

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: The purse seine fleet operating in GSA 06 Northern Spain is composed by 132 units: 4% are smaller than 12 m in length, 87% between 12 and 24 m and 9% bigger than 24 m. The fleet continuously decreased in the last twelve years, from more than 222 vessels in 1995 to 132 in 2007. This stronger reduction (41%) is possibly related to a decreasing in anchovy catches.

Anchovy and Sardine (*Sardina pilchardus)* are the main target species of the purse seine fleet in Northern Spain GSA06, but other species with lower economical importance are also captured, sometimes representing a high percentage of the capture: horse mackerel *(Trachurus spp.)*, mackerel *(Scomber spp.)*, and gilt sardine *(Sardinella aurita)*.

Anchovy is the species with the highest economical value. The annual landings of anchovy in the Northern Spain for the last seventeen years ranged between 2000 and 23000 tons. The minimum values were recorded during 2007.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is GFCM-SAC. This assessment is based on acoustic surveys, commercial landings and CPUEs. A DEPM evaluation was carried out in June 2007.

From 2008 advice is provide also by SGMED.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: GFCM-SAC estimated very low level of biomass. Anchovy biomass in year 2007 was the lowest for the past 8 years, 4906 tons, 40% lower than in year 2006. The recruitment has been low, the population consists almost exclusively of the recruits and has practically disappeared between southern Rosas Bay and Tarragona (North Ebro River Delta).

SGMED estimated that both total biomass (TB=7,860 t) and Spawning Stock Biomass in 2007 (SSB=5,480 t) continues the sharp decrease, apparent from the beginning of the time series. The lowest observed SSB is the most recent estimate from 2007 (Bloss=5,480 t). Recruitment in 2007 (R=244 millions) decreases from that of

2006 (361 millions). WG highlighted that the fishery is highly dependent of the recruitment strength. Fishing mortality has been fluctuating around 1.15, without a clear trend. $F_{(0-2)}$ in 2007 = 1.17.

RECENT MANAGEMENT ADVICE: According to GFCM-SAC fishing effort should be reduced. It should be noted that small pelagic fishery in GSA 06 is multispecies and effort on sardine and anchovy should be considered together. According to SGMED recent assessment (2008) fishing mortality should be reduced in order to allow future recruitment contributing to stock recovery. This requires consideration of the mixed fisheries nature of the fleets.

STECF COMMENTS: STECF agrees with the advice of the GFCM-SAC Sub-Committee on Stock Assessment (SCSA) and with SGMED. Because the stock is shared between the GSA 06 (Northern Spain) and the GSA 07 (Gulf of Lions), STECF recommends joint acoustic surveys covering both GSAs.

7.4. European anchovy *(Engraulis encrasicolus)* in Geographical Sub Area 7. Gulf of Lions

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: In the Gulf of Lions, pelagic fisheries are targeting anchovy and sardine (*Sardina pilchardus*) An average of 50 trawlers have targeted these pelagic species in recent years. There are also 14 purse seiners operating in the south of the Gulf of Lions that catch these species. Some purse seine boats from Spain come in the area to fish mainly sardine. Fishing effort depends on market fluctuations.

The annual landings of anchovy in the last years are between 2000 and 7000 t (3000 t in 2007).

SOURCE OF MANAGEMENT ADVICE: The management advisory body is GFCM-SAC. The data sources were time series of acoustic surveys, landings and CPUE. The acoustic surveys are performed at daytime in July. The acoustic assessment results are completed by an analysis of catches and fishing effort to improve the fisheries diagnoses.

The anchovy stock has also been evaluated by the DEPM in 2007 in the area corresponding to Gulf of Lions and North Catalan Sea.

From 2008 advice is provide also by SGMED.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: GFCM-SAC indicate that the anchovy biomass estimate in GSA 07 with acoustic survey shows a decrease from 26000 t in 2006 to 18500 t in 2007. The DEPM spawning biomass estimate for the Gulf of Lions – North Catalan Sea was 21000 t in 2007.

SGMED is unable to precisely estimate the absolute levels of stock abundance and biomass. Survey indices indicate that recent stock biomass (2005-2007) remains at the lowest level observed since 1993. The acoustic method applied results in an estimate of 18,473 t of total biomass in 2007. Recruitment since 2004 is estimated to be low in relation to the time series available.

RECENT MANAGEMENT ADVICE: It is recommended not to increase the fishing effort.

STECF COMMENTS: STECF notes that SGMED was unable to fully evaluate the exploitation status of the stock and therefore could not advise accordingly. STECF agrees with the GFCM-SAC Sub-Committee on Stock Assessment (SCSA) and with SGMED that the stock was estimated at it lowest stock size in 2006.

7.5. European anchovy (*Engraulis encrasicolus)* in Geographical Sub Area 16. Strait of Sicily

FISHERIES: In Sciacca port, the most important base port for the landings of small pelagic fish species along the southern Sicilian coast (GSA16), accounting for about 2/3 of total landings in GSA 16, two operational units (OU) are presently active, purse seiners and pelagic pair trawlers. The fleet in GSA16 is composed by about 50 units (17 purse seiners and 30 pelagic pair trawlers were counted up in a census carried out in December 2006). In both OUs, anchovy represents the main target species due to the higher market price.

Average anchovy landings over the last decade (1997-2008) were about 1,600 metric tons, with large inter-annual fluctuations. Total effort was slightly increasing over the same period.

It is worth noting that, though trend in biomass is clearly decreasing over recent years, landings levels over the same period were relatively high, indicating an increased vulnerability of the resource. Discards are estimated to be less than 5% of total catch for both the pelagic pair trawl and the purse seine fisheries. Effort data for pelagic trawling and purse seine are available for the port of Sciacca since 1998.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is GFCM-SAC. From 2008 advice is also provided by SGMED. Census data for catch and effort data were obtained from census information (on deck interviews) in Sciacca port, Acoustic data were used for fish biomass evaluations. Biological sampling and the collection of catch and effort data were also performed. The studied area corresponds to the area extending on the continental shelf from the southern Sicily coast up to a depth of about 200 m. Time series of acoustic biomass estimates cover the period 1998 – 2008.

PRECAUTIONARY REFERENCE POINTS: SGMED 09-02 proposed E_{msy} (F/Z, F age range 0-3)= 0.4 as a proxy reference point for F_{msy}.

STOCK STATUS: Acoustic estimates of anchovy biomass ranged from a minimum of 6300 tons in 2006 to a maximum of 32000 tons in 2005. The acoustic survey biomass estimate for 2007 is 6700 t, quite similar to 2006. Biomass estimates of total population obtained by hydroacoustic surveys for anchovy in GSA 16 show a decreasing trend over recent years. The most recent estimate (2008) is the lowest value of the series and represents approximately just one-tenth of the maximum recorded value. However, in the absence of proposed or agreed biomass reference points, SGMED-09-02 is unable to fully evaluate the state of the stock with respect to biomass.

The high and increasing annual exploitation rates, as estimated by the ratio between total landings and biomass, indicates high fishing mortality levels. If this estimate of exploitation rate can be considered as equivalent to F/Z estimate obtained from the fitting of standard stock assessment models, the current exploitation (0.64) is higher than the reference point suggested by Patterson (1992) and SGMED 09-02. The fishing mortality level corresponding to F/Z=0.64 corresponding to a fishing mortality of F=1.17 assuming a natural mortality of M=0.66 as estimated using Pauly's (1980) empirical equation. Using the above assumptions and the proposed reference point of F/Z = 0.4, the stock appears to be overexploited.

RECENT MANAGEMENT ADVICE: Given the very low biomass for three consecutive years (2006, 2007 and 2008) and the current high exploitation rates, the SGMED WG 09-02 advised that fishing mortality should be reduced towards F/Z= 0.4 in order to promote stock recovery and avoid future loss in stock productivity and landings.

STECF COMMENTS: STECF endorses the SGMED 09-02 and GFCM-SAC advice that fishing mortality should be reduced towards F/Z= 0.4 in order to promote stock recovery and avoid future loss in stock productivity and landings.

STECF reiterates its previous recommendation that further research be undertaken to evaluate the impact of targeted fishing of larval stages of sardine (*bianchetto*) on the juvenile anchovy population.

7.6. European anchovy *(Engraulis encrasicolus)* in Geographical Sub Area 17. Northern Adriatic and Central Adriatic

FISHERIES: Anchovy, together with sardine, is one of the most important commercial species of the Adriatic Sea. The stock of anchovy living in the northern and central Adriatic Sea (GFCM-GSA 17) is shared between Italy, Slovenia and Croatia. The stocks are exploited by mid-water trawlers and purse seiners. In 2007, the Italian fleet was composed of about 130 (65 pairs) pelagic trawlers (*volante*) mainly operating from Trieste to Ancona (average GRT 43, average engine power 290 kW) and about 45 purse seiners attracting fish with light (*lampara*), operating in the Gulf of Trieste (24 small *lampara*, average GRT 9, average engine power 110 kW) and in the Central Adriatic (21 big *lampara*, average GRT 97, average engine power 390 kW). In 2007, the Slovenian fleet was composed of 1 pelagic trawler pair and 7 purse seiners; Croatian purse seine fleet is composed by 134 units with LOA greater than 15 meters. No data are available for purse seine boats with LOA lower/equal than 15 meters.

The main fraction of the total catch has been usually taken by the Italian fleet but, in recent years, the fraction relative to the fleets of the eastern part of the GSA17 has increased. Fisheries by boat seines and small trawlers targeting the transparent goby (*Aphia minuta*) as well as fries of small pelagic species are authorised for 60 days in wintertime in Italy. Italian regulations prohibit fishing with trawls and mid-water pair trawls for about 25/30 days between July and September. This closed season does not apply to purse seiners. Fishing activity is suspended during the weekend.

Anchovy landings for the whole area are about 43000 t per year (average of the last three years), with an increase in 2007. No information was given for 2008. The assessment is based on data time series up to 2007.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is GFCM-SAC. From 2008 advice is also provided by SGMED. The present assessment of this stock has been carried out by means of VPA, tuned with echo-survey data. Catch and fishing effort data were collected for the period 1975-2007 along with biological data. Length frequency and age length data were combined to obtain annual catch-at-age series from 1975 onwards, which represented the basic input of VPA.

PRECAUTIONARY REFERENCE POINTS:

GFCM-SAC proposed a precautionary reference point based on the ratio F/(F+M) not higher than 0.4 for this stock.

Based on its evaluation SGMED 09 02, proposed the following biological reference points for this stock.

Bpa (spawning stock) ≥ 80,000 t	Proxy
Blim (spawning stock) ≥ 50,000 t	Proxy
Elim (F/Z, F age range 0-3) ≤ 0.4	Proxy

STOCK STATUS: SGMED 09-02 has modified the assessment carried out last year in accordance with its recommendations regarding natural mortality to be applied (Murcia workshop of SGMED 09-01, 2-6 March 2009). No update with 2008 catch data was conducted. After a drastic decline the stock biomass reached its minimum in the late 1980s and recovered thereafter to about 130,000 t in 2007. The stock is considered to having its full reproductive capacity. SGMED 09-02 estimated recent recruitment to be at an average level (1976-2007).
SGMED 09-02 estimated the most recent exploitation rates in 2005-2007 as at or slightly below the proposed sustainable level. As such, the stock is considered sustainably harvested.

RECENT MANAGEMENT ADVICE: GFCM-SAC in 2008 assesssment recommended that fishing effort should not be allowed to increase. It should be noted that small pelagic fishery in GSA 17 is multispecies and effort on sardine and anchovy should be considered together. SGMED 09-02 recommended to maintain the effort constant and to determine consistent catches. Technical interactions regarding the fisheries targeting the sardine stock in GSA 17 need to be taken into account when managing the anchovy fisheries. The possibility to include acoustic survey data carried out in the eastern part of GSA17 as a tuning fleet within the assessment should be explored.

SGMED 09-02 notes that there was no information presented during the meeting regarding the fry fishery within GSA17. The catches of fry fishery are believed to be negligible in this GSA by CNR-ISMAR-SPM Fish Population Dynamics Unit. Fry fishery may be more important in GSA18 and an ongoing EU funded project (SARDONE) will allow to evaluate if this fishery has an impact also on the stock in GSA17.

STECF COMMENTS: STECF endorses the advice of the SGMED 09-02 and GFCM-SAC.

7.7. European anchovy *(Engraulis encrasicolus)* in Geographical Sub Area 18. Southern Adriatic

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: Purse seiners are the main fishing vessels targeting anchovy (and sardine) in GSA 18. During spring and summer seasons fishing is concentrated in the Central Adriatic where the highest catches can be obtained.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is GFCM-SAC. Stock biomass estimates are based on an acoustic survey carried out in the western part of GSA 18.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: The GFCM-SAC classifies this stock as having Intermediate level of abundance.

RECENT MANAGEMENT ADVICE: Not to increase fishing effort.

STECF COMMENTS: STECF agrees with the advice of the SAC-GFCM Sub-Committee on Stock Assessment (SCSA). STECF notes that the data and information provided to the GFCM on anchovy in GSA 18 is very poor. STECF recommends that the area covered by the acoustic survey be extended to include the eastern part of GSA 18.

No assessment has been presented to GFCM-SAC Sub-Committee in 2008 and no other information was available to STECF for this stock.

7.8. European anchovy *(Engraulis encrasicolus)* in Geographical Sub Area 22. Aegean Sea

FISHERIES: In GSA 22 (Greek part) anchovy is almost exclusively exploited by the purse seine fleet. Pelagic trawls are banned and benthic trawls are allowed to fish small pelagics in percentages less than 5% of their total catch. Enforced regulations include a closed period from mid December till the end of February, and technical measures such as minimum distance from shore and gear restrictions. There is a minimum landing size of 9 cm.

Anchovy landings showed an increasing trend towards 2008. Reported landings showed an increasing trend since 2002, comprising 24,480 tons in 2008. Information regarding the age and length distribution of anhcovy landings prior to 2003 is based on the Hellenic Centre of Marine Research data collection system.

Data of the fishing effort (Days at Sea) and the landings per vessel class indicate that small vessels (12-24 m) are mainly responsible for anchovy catches (>70% of anchovy catches). In 2008, the catches of the 12-24m vessels were 18,188 t and of the 24-40m vessels were 6,293 t. Discards are less than 1%.

The size of the Greek fleet in the Aegean Sea (GSA 22) ranged between 149 and 160 fishing vessels from 2000 to 2006. The main fishing ground for anchovy in GSA 22 is northern Aegean Sea.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is GFCM-SAC. From 2008 advice is provided also by SGMED. The last assessment in SGMED 09 02 is based on fishery independent surveys information as well as on Integrated Catch at Age (ICA) analysis model. Specifically, acoustic surveys estimations were used for Total Biomass estimates and DEPM surveys for the estimation of SSB. The application of ICA was based on commercial catch data (2000-2008). Biomass estimates from acoustic surveys and the Daily Egg Production Method (DEPM) estimates over the period 2003-2008 were used as tuning indices.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points were proposed by GFCM-SAC for this stock.

SGMED proposed the following biological reference point for this stock:

E_{lim} (F/Z, age range 1-3)<=0.4	Proxy

STOCK STATUS: The SGMED 09 02, noticed that survey indices and VPA analyses indicate that total biomass and SSB increased since 2005. Given the short length of the time series, SGMED is unable to precisely estimate the absolute levels of stock abundance and biomass. Biomass limit reference points have not been estimated for this stock, and hence advice relative to these cannot be provided by SGMED. ICA model estimates suggest an increase in recruitment since 2004, with a pronounced increase in 2008. However the model predicts a decrease in the population abundance at age 0 for 2009 to the 2006 abundance level.

Based on ICA results, the mean E=F/Z (F averaged over ages 1 to 3) has fluctuated around 0.36 and since 2004 has been below the empirical level of sustainability suggested as target exploitation level for this stock.Thus, the stock is considered to be exploited sustainably.

RECENT MANAGEMENT ADVICE: Taking the empirical level as a reference point for sustainable exploitation, the stock is considered to be exploited sustainably. Increased fishing is not expected to result in increased landings in the long term. SGMED 09-02 recommends not to increase the effort and that short- and medium-term predictions of catch and stock biomass consistent with a range of effort changes should be provided.

Technical interactions regarding the fisheries targeting the sardine stock in GSA 22 need to be taken into account when managing the anchovy fisheries. For precautionary reasons the possibility of changing the closed period should be examined. Since the purse seine fishery is a multispecies fishery targeting both anchovy and sardine, a shift of the closed period (present: mid December to end of February) towards the recruitment period of anchovy (e.g. October to December) / or the recruitment period of sardine (e.g. February to April) could be suggested. This approach has the potential to improve the selectivity of the fishery, and thus provide higher potential catch in the long term.

STECF COMMENTS: STECF endorses the SGMED 09-02 advice not to increase effort. The alternative suggestions for a closed period will have different outcomes for each species and STECF highlights the need for further research concerning the definition of the closed period. STECF notes that there was no advice provided by GFCM-SAC in 2008.

7.9. Sardine (*Sardina pilchardus)* in Geographical Sub Area 1. Northern Alboran Sea

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: The purse seine fleet operating in GSA 01 Northern Alboran Sea is composed by 136 units, characterised by small vessels. 22% of them are smaller than 12 m, 78% between 12 and 24 m. The fleet has been continuously decreasing since eighties, from more than 230 vessels in 1980 to 136 in 2007.

Sardine and anchovy (*Engraulis encrasicolus*) are the main target species of the purse seine fleet in Northern Spain GSA01, but other species with lower economical importance are also captured, sometimes representing a high percentage of the capture: horse mackerel (*Trachurus* spp.), mackerel (*Scomber* spp.) and gilt sardine (*Sardinella aurita*).

The annual landings of sardine in the Northern Alborán Sea show a strong annual fluctuation for the last eighteen years ranged between 4000 and 11000 tons. Landings increase in 2007, reaching up 6770 t. Although the economical value of this species is lower than anchovy the high volume of catches makes it a valuable fishery.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is GFCM-SAC. This assessment is based on both on VPA (XSA) methods and acoustic methods. In 2007 acoustic survey was not performed.

From 2008 advice is provide also by SGMED.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: The GFCM-SAC classifies this stock as having intermediate abundance. The stock is fully exploited. A moderate fishing mortality has been observed.

SGMED estimated that both Total biomass in 2007 (TB=32,300 t) and Spawning Stock Biomass in 2007 (SSB=28,800 t) decreased since 2005, although the levels are still over the lowest SSB in the time series (in 2000). Recruitment levels in 2006 and 2007 are low relative to the rest of the time series (R=228 millions). Since 2000 fishing mortality (F1-3) has varied between 0.2 and 0.4, without any consistent trend (F=0.26).

RECENT MANAGEMENT ADVICE: Not to increase the fishing effort beyond the current levels. It should be noted that small pelagic fishery in GSA 01 is multispecies and effort on sardine and anchovy should be considered together.

SGMED recommends that fishing mortality should not be increased.

STECF COMMENTS: STECF agrees with the advice of the GFCM-SAC Sub-Committee on Stock Assessment (SCSA) and SGMED.

7.10. Sardine (*Sardina pilchardus*) in Geographical Sub Area 3. Southern Alboran Sea

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: The purse seine fleet operating in GSA 03 Southern Alboran Sea is composed of about 150 boats distributed in seven Mediterranean ports.

Sardine is the most important pelagic fish in the Mediterranean Moroccan waters with a mean yearly landing of 14,000 t.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is the GFCM-SAC. The evaluation of the state of the stock was based on LCA using VIT software. Data collected in 2007 were used.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: Yield per recruit analysis indicates that the stock is fully exploited. Based on a preliminary assessment, considerable values of fishing mortality were observed for small individuals. Fishing effort is exercised mainly on adult individuals (17-19 cm).

RECENT MANAGEMENT ADVICE: Not to increase the current level of fishing effort.

STECF COMMENTS: STECF has no comments.

7.11. Sardine (*Sardina pilchardus*) in Geographical Sub Area 6. Northern Spain

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: The purse seine fleet operate in GSA 06 Northern Spain is composed by 132 units: 4% are smaller than12 m in length, 87% between 12 and 24 m and 9% bigger than 24 m. The fleet continuously decreased in the last twelve years, from more than 222 vessels in 1995 to 132 in 2007. This stronger reduction (41%) is possibly linked to a decreasing in anchovy catches.

Sardine and anchovy (*Engraulis encrasicolus*) are the main target species of the purse seine fleet in Northern Spain GSA06, but other species with lower economical importance are also captured, sometimes representing a high percentage of the capture: horse mackerel (*Trachurus spp.*), mackerel (*Scomber spp.*), and gilt sardine (*Sardinella aurita*).

The annual landings of sardine in the Northern Spain for the last eighteen years ranged between 19000 and 53000 tons. This species is the most fished one in GSA 06, both for pelagic and demersal species. Although its economical value is lower than anchovy the high volume of catches makes it a valuable fishery.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is GFCM-SAC. This assessment is based on both on VPA (XSA) methods and acoustic methods. Both XSA and acoustics methods have the same perception of the state of the stock.

From 2008 advice is provide also by SGMED.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: The GFCM-SAC classifies this stock as having intermediate abundance. The stock is fully exploited. A high fishing mortality has been observed.

SGMED estimated that SSB has decreased from 1994 to 2002 from about 80,000 t to about 40,000 t, and has subsequently increased to around 50,000 t in 2007. Recent recruitment in 2006 and 2007 has been estimated to be below average. Fishing mortality has declined from a high level in 1994 and 2001, to 2003, and has subsequently fluctuated around the 2003 level. F1-3 in 2007 =0.83.

RECENT MANAGEMENT ADVICE: Not to increase the fishing effort beyond the current levels. It should be noted that small pelagic fishery in GSA 06 is multispecies and effort on sardine and anchovy should be considered together.

SGMED is not in a position to provide any advice for that stock.

STECF COMMENTS: STECF notes that SGMED was unable to fully evaluate the exploitation status of the stock and therefore unable to advise accordingly. STECF agrees with the assessment of the GFCM-SAC Sub-Committee on Stock Assessment (SCSA) but notes that in the absence of reference points no advice can be provided.

7.12. Sardine (*Sardina pilchardus)* in Geographical Sub Area 7. Gulf of Lions

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: In the Gulf of Lions, pelagic fisheries are targeting sardine and anchovy (Engraulis encrasicolus). A mean of 50 trawlers are targeting these pelagic species during the last years. There are also 14 purse seiners operating in the south of the Gulf of Lions that catch these species. Some purse seine boats from Spain come in the area to fish mainly sardine. Fishing effort depends on market fluctuations. Landed catches in 2007 were 13000 t.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is GFCM-SAC. Data sources were time series of acoustic surveys, landings and CPUE. The acoustic surveys are performed at daytime in July. The acoustic assessment results are completed by an analysis of catches and fishing effort to improve the fisheries diagnoses.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: The GFCM-SAC classifies this stock as having intermediate abundance. The biomass estimate shows a decrease from 83000 t in 2006 to 56000 t in 2007. First results of 2008 acoustic survey show a strong recruitment for sardine.

RECENT MANAGEMENT ADVICE: It is recommended not to increase the fishing effort, even if it appears a strong recruitment of sardine in 2008.

STECF COMMENTS: STECF agrees with the assessment of the GFCM-SAC Sub-Committee on Stock Assessment (SCSA) but notes that in the absence of reference points no advice can be provided.

7.13. Sardine (*Sardina pilchardus)* in Geographical Sub Area 16. Strait of Sicily

FISHERIES: In Sciacca port, the most important base port for the landings of small pelagic fish species along the southern Sicilian coast (GSA16), accounting for about 2/3 of total landings in GSA 16, two operational units (OU) are presently active, purse seiners and pelagic pair trawlers. The fleet in GSA16 is composed by about 50 units (17 purse seiners and 30 pelagic pair trawlers were counted up in a census carried out in December 2006). In both OUs, anchovy represents the main target species due to the higher market price.

Average sardine landings over the last decade (1997-2008) were about 1,500 metric tons, with a general decreasing trend. Total effort was slightly increasing over the same period.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is GFCM-SAC. Since 2008 management advice is given by SGMED. Census data for catch and effort data were obtained from census information (on deck interviews) in Sciacca port. Acoustic data were used for fish biomass evaluations.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock. In SGMED 09 02 the exploitation rate <=0.4 was set as reference point for this stock.

E (F/Z, F age range 0-3) ≤ 0.4	Proxy

STOCK STATUS (based on SGMED 09 02 assessment): Biomass estimates of the total population obtained by hydro-acoustic surveys for sardine in GSA 16 show that the recent stock level is well below the average value over the last decade. However, in the absence of proposed or agreed biomass reference points, SGMED-09-02 is unable to provide any scientific advise in relation to them.

Annual exploitation rates, as estimated by the ratio between total landings and biomass, indicated relatively low fishing mortality during the last decade. If this estimate of exploitation rate can be considered as equivalent to F/Z estimate obtained from the fitting of standard stock assessment models, the current exploitation rate (0.22) and even all the previous available estimates are lower than the reference point suggested by Patterson (1992) and confirmed by SGMED 09-02. Using the exploitation rate as a target reference point, the stock of sardine in GSA 16 is considered as being sustainably exploited.

RECENT MANAGEMENT ADVICE: Given that biomass was quite low for three consecutive years (2006, 2007 and 2008) and that the exploitation rate of sardine was occasionally moderate over the last decade, SGMED recommended the relevant fishing effort should not be allowed to increase in order to avoid future loss in stock productivity and landings. However, as the small pelagic fishery is generally multispecies, any enforcement about fishing effort for anchovy stock would also have effects on sardine. In addition, due to the low level of the anchovy stock, measures should be taken to prevent a shift of effort from anchovy to sardine.

The stock did not recover from the 2006 "collapse" in biomass (-52% from July 2005 to June 2006), and this fact, along with the moderate exploitation rates experienced over the last decade and the decreasing trend in landings, posed questions about the sustainability of current levels of fishing effort. Possible negative effects on these populations could results from pressure of other fishing gears on larval stages. A warning on the fishing of larval stages (locally named *bianchetto*) is relevant, taking into account that in the past years derogation of the fishing ban was normally operated in wintertime, i.e. during the sardine spawning season, even though more data and investigation are needed in order to estimate the possible impact of this fishing activity on the exploited populations.

STECF COMMENTS: STECF endorses the recommendations by SGMED 09-02 and GFCM-SAC not to increase the fishing effort in order to avoid future loss in stock productivity and landings.

STECF reiterates its previous recommendation that further research be undertaken to evaluate the impact of (*bianchetto*) fishery of sardine population.

7.14. Sardine (*Sardina pilchardus)* in Geographical Sub Area 17. Northern Adriatic and Central Adriatic

FISHERIES: Sardine, together with anchovy, is one of the most important commercial species of the Adriatic Sea. The stock of sardine living in the northern and central Adriatic Sea (GFCM-GSA 17) is shared between Italy, Slovenia and Croatia. The Adriatic small pelagic fleet is targeting both sardine and anchovy.

In 2007, the Italian fleet was composed of about 130 (65 pairs) pelagic trawlers (*volante*) mainly operating from Trieste to Ancona and about 45 purse seiners attracting fish with light (*lampara*), operating in the Gulf of Trieste and in the Central Adriatic. In 2007, the Slovenian fleet was composed of 1 pelagic trawler pair and 7 purse seiners. In 2008, the Croatian purse seine fleet was composed by 134 units with LOA greater than 15 meters. No data are available for purse seine boats with LOA lower/equal than 15 meters.

Fisheries by boat seines and small trawlers targeting the transparent goby (*Aphia minuta*) as well as fry of small pelagic species are authorised for 60 days in wintertime in Italy. Italian regulations prohibit fishing with trawls and mid-water pair trawls for about 25/30 days between July and September. This closed season does not apply to purse seiners. Fishing activity is suspended during the weekend.

No new landings data were provided in the SGMED 09 02. Sardine landings for the whole area were about 17,000 t per year (average of the last three years), with an increase in 2007. Due to low market price for sardine in Italy, discards of sardine at sea may occur. Between 1987 and 1999, discard estimates averaged about 2,000 t per year. No information on discards was available in the recent years, but it is reasonable to consider discards negligible, because of the decrease of catches.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is GFCM-SAC. Since 2008, advice is also provided by SGMED.

The assessment of this stock was carried out by means of Virtual Population Analysis (VPA), using catch data collected for Italy, Slovenia and Croatia, from 1975 to 2007. The Laurec-Shepherd tuning of VPA was performed using an abundance index series derived from echo-surveys carried out in the western part of the GSA17. In 2009, VPA was also carried out using vectors of natural mortality rate at age, i.e. not constant over age as in the stock assessment of 2008. They were derived from Probiom software and Gislason's method, according to the first SGMED meeting of 2009).

PRECAUTIONARY REFERENCE POINTS: GFCM-SAC proposed a precautionary reference point based on the ratio F/(F+M) not higher then 0.4 for this stock.

SGMED proposed the following biological reference points for this stock.

B_{pa} (spawning stock)= 270,000 t	
B_{lim} (spawning stock= 180,000 t	
E_{lim} (F/Z, F age range 0-5) ≤ 0.4	Proxy

STOCK STATUS: According to GFCM-SAC 2008 assessment, the stock was over-exploited. The biomass estimated was about 90,000 t (average of the period 2005-2007) with a slight increase in 2007. The exploitation rate (F/F+M) wass higher than 0.4 in most recent years, while in 2007, it was estimated at 0.46, above the limit of 0.4 (precautionary reference point). The mean catch-biomass ratio of the last three years is 0.19, which is within the historically observed range (0.19-0.25). A low level of spawning biomass has been observed since 1999.

The most recent assessment has been done in SGMED 09-02, where the assessment carried in 2008 was modified in accordance with the recommendations of SGMED 09-01 workshop regarding the natural mortality. No update assessment with 2008 catch data was conducted. The average stock biomass estimated by VPA was 440,000 tonnes in 1975-2007 and 90,000 tonnes in 2005-2007. Spawning stock biomass showed the lowest levels in recent years. The stock status of sardine in GSA 17 was considered being far below its full reproductive capacity (in relation to Bpa and Blim). Since the mid 1990s, recruitment remained significantly below the average recruitment. SGMED 09-02 considers the stock of sardine to be over-exploited, as the estimated E almost continuously exceeds 0.4 since 1998.

RECENT MANAGEMENT ADVICE: The advice from the GFCM-SAC 2008 was that fishing effort should be reduced. It should be noted that small pelagic fishery in GSA 17 is multispecies and effort on sardine and anchovy should be considered together. GFCM-SAC specifically recommends to establish a closed season of at least 45 days.

SGMED 09-02 recommended recovering the stock biomass in order to increase stock productivity. Fishing mortality should be reduced until fishing mortality is below F/Z=0.4 in order to allow future recruitment contributing to stock recovery. In order to decrease the fishing mortality, SGMED 09-02 advised that fishing effort should be reduced by means of a multiannual management plan and that short- and medium-term predictions of catch and stock biomass consistent with a range of effort changes should be provided.

The management of the sardine fisheries in GSA 17 needs to account for multi-species effects, mainly the interaction with anchovy.

STECF COMMENTS: STECF endorses the advice of the SGMED 09-02 and agrees with GFCM-SAC that fishing mortality should be reduced until fishing mortality is below F/Z=0.4.

SGMED notes that there was no information presented during the meeting regarding the fry fishery within GSA17. The catches of fry fishery are believed to be negligible in this GSA by CNR-ISMAR-SPM Fish Population Dynamics Unit. Fry fishery may be more important in GSA18 and an ongoing EU funded project (SARDONE) will allow to evaluate if this fishery has an impact also on the stock in GSA17.

STECF notes that further research is needed to assess the impact of fry fishing on the sardine stock in GSA 17.

7.15. Sardine *(Sardina pilchardus)* in Geographical Sub Area 18. Southern Adriatic

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: Purse seiners are the main fishing vessels targeting sardine (and anchovy) in GSA 18. During spring and summer seasons, fishing is concentrated in the Central Adriatic where the highest catches can be obtained.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is GFCM-SAC. Stock biomass estimates are based on an acoustic survey carried out in the western part of GSA 18.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: Unknown.

RECENT MANAGEMENT ADVICE: GFCM-SAC has not provided advice on this stock.

STECF COMMENTS: STECF has no comments.

7.16. Sardine (*Sardina pilchardus)* in Geographical Sub Area 22. Aegean Sea

FISHERIES: In GSA 22 (Greek part) sardine is almost exclusively exploited by the purse seine fleet. Pelagic trawls are banned and benthic trawls are allowed to fish small pelagics in percentages less than 5% of their total catch. Enforced regulations include a closed period from mid December till the end of February, and technical measures such as minimum distance from shore and gear restrictions. There is a minimum landing size of 11 cm.

Sardine landings showed high variability indicating a decreasing trend between 2005 and 2008, comprising approximately 9,700 tons in 2008. The purse seine fishery is considered a mixed fishery, where sardine, anchovy and other species are caught. Discards are <1% of the catches.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is GFCM-SAC. From 2008 advice is provide also by SGMED. The latest SGMED assessment was based on fishery independent surveys information as well as on Integrated Catch at Age (ICA) analysis model. Acoustic surveys estimations were used for Total Biomass estimates. The application of ICA was based on commercial catch data (2000-2008). Biomass estimates from acoustic surveys over the period 2003-2008 were used as tuning indices. Sardine data were comprised of annual sardine landings, annual sardine catch at age data (2000-2008), mean weights at age, maturity at age at age and the results of acoustic surveys.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points were proposed by GFCM-SAC for this stock. No reference points concerning biomass were suggested. F_{max} and $F_{0.1}$ are overestimated so precautionary the F_{pa} is suggestd to be set as the fishing mortality that assures exploitation rate below the empirical level for stock decline (E<0.4, Patterson 1992) for small pelagic.

E_{lim} (F/Z, age range 1-3)<=0.4	Proxy

STOCK STATUS: The GFCM-SAC 2008 classified this stock as having intermediate level of abundance. There is uncertainty in order to consider the stock fully or over-exploited. High fishing mortality has been observed.

The results of the short time series of data do not allow concluding on reference points of B_{lim} or B_{pa}. In the absence of proposed or agreed biomass references points, SGMED-09-02 is unable to fully evaluate the state of the stock and provide scientific advice. Results of the Integrated Catch at Age analysis indicated an increasing trend in total biomass and SSB showing a slight recovery of SSB to 20,000 t in 2008 from the low 2003-2004 estimates of 7,000 t. ICA model estimates showed above average recruitment since 2007, with a very high peak in 2008. Based on ICA results, the mean fishing mortality (averaged over ages 1 to 3) showed a clear decreasing trend, and has remained below 0.75 since 2004. The mean F/Z has declined from 2003 but remains above the suggested level of sustainability (E≤0.4) for this stock. Taking the empirical level as a reference point for sustainable exploitation, the stock is considered to be overexploited.

RECENT MANAGEMENT ADVICE:

Given the current high exploitation rates, SGMED recommended that fishing mortality should be reduced to F/Z= 0.4. In order to decrease the fishing mortality, SGMED 09-02 advised that fishing effort should be reduced by means of a multiannual management plan and that short- and medium-term predictions of catch and stock biomass consistent with a range of effort changes should be provided. The management of the sardine fisheries in GSA 22 needs to account for multi-species effects, mainly the interaction with anchovy.

For precautionary reasons the possibility of changing the closed period should be examined. Since the purse seine fishery is a multispecies fishery targeting both anchovy and sardine, a shift of the closed period (present: mid December to end of February) towards the recruitment period of anchovy (e.g. October to December) / or

the recruitment period of sardine (e.g. February to April) could be suggested. This approach has the potential to improve the selectivity of the fishery, and thus provide higher potential catch in the long term.

STECF COMMENTS: STECF endorses the advice of the SGMED 09-02 to decrease fishing effort. STECF notes that the same fleet exploits both anchovy and sardine in GSA 22. The alternative suggestions for a closed period will have different outcomes for each species and STECF highlights the need for further research concerning the definition of the closed period. STECF notes that GFCM-SAC has not assessed the stock and not provided advice.

7.17. Sprat (*Sprattus sprattus)* in Geographical Sub Area 17. Northern Adriatic and Central Adriatic

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: Sprat are fished by the same fleet targeting anchovy and sardine (see section of Anchovy in Geographical Sub-Area 17 for fleet description). Italian fleet discard sprats at sea, while Slovenian and Croatian land them. The level of catches is unknown.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM. Biomass estimation is based on acoustic survey.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: The biomass estimate obtained by the 2005 acoustic survey is 21,000 t.

RECENT MANAGEMENT ADVICE: No specific advice is given by the SAC-GFCM Sub-Committee on Stock Assessment (SCSA).

STECF COMMENTS: STECF notes that the information presented on this stock and fishery is poor and in the absence of any reliable biological reference points, is unable to assess the status of the resource or its exploitation rate. Consequently, STECF is unable to advise on an appropriate exploitation rate for this stock. No assessment has been presented to SAC-GFCM Sub-Committee in 2008 and no other information was available to STECF for this stock.

7.18. Mackerel *(Scomber japonicus)* in Geographical Sub Area 3. Southern Alboran Sea

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: Fishing fleet is composed by 147 boats, distributed in seven Mediterranean ports, targeting small pelagics. The level of catches is unknown.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM. Data sources were acoustic surveys and landings.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: The biomass estimate obtained by the acoustic survey performed in May 2006 is 3,000 t.

RECENT MANAGEMENT ADVICE: No specific advice is given by the SAC-GFCM Sub-Committee on Stock Assessment (SCSA).

STECF COMMENTS: STECF notes that the information presented on this stock and fishery is poor and in the absence of any reliable biological reference points, is unable to assess the status of the resource or its exploitation rate. Consequently, STECF is unable to advise on an appropriate exploitation rate for this stock.

No assessment has been presented to SAC-GFCM Sub-Committee in 2008 and no other information was available to STECF for this stock.

7.19. Horse mackerel *(Trachurus trachurus)* in Geographical Sub Area 3. Southern Alboran Sea

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: Fishing fleet is composed by 147 boats, distributed in seven Mediterranean ports, targeting small pelagics. The level of catches is unknown.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM. Data sources were acoustic surveys and landings.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: The biomass estimate obtained by the acoustic survey performed in May 2006 is 71,000 t.

RECENT MANAGEMENT ADVICE: No specific advice is given by the SAC-GFCM Sub-Committee on Stock Assessment (SCSA).

STECF COMMENTS: STECF notes that the information presented on this stock and fishery is poor and in the absence of any reliable biological reference points, is unable to assess the status of the resource or its exploitation rate. Consequently, STECF is unable to advise on an appropriate exploitation rate for this stock.

No assessment has been presented to SAC-GFCM Sub-Committee in 2008 and no other information was available to STECF for this stock.

7.20. Striped mullet (*Mullus surmuletus)* in Geographical Sub Area 5. Balearic Islands

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: Striped red mullet (Mullus surmuletus) is one of the most important target species in the trawl fishery developed by around 40 vessels off Mallorca (Balearic Islands, GFCM-GSA05). A fraction of the small-scale fleet (~100 boats) also directs to this species during the second semester of the year, using both trammel nets and gillnets. During the last decade, the annual landings of this species have oscillated between 73-117 and 17-29 tons in the trawl and small-scale fishery, respectively.

SOURCE OF MANAGEMENT ADVICE: The stock of Mullus surmuletus of the GFCM-GSA05 has been assessed using data from both the trawl and the small-scale fishery on a time series covering eight years (2000-2007). The assessment has been carried out applying tuned VPA (Extended Survivor Analysis, XSA) on the cohorts present during 2000-2007 and both VPA and Y/R analysis on a mean pseudo-cohort from that period. These approaches were performed using monthly size composition of catches, official landings and the biological parameters estimated within the framework of the Data Collection Programme (2003-2004).

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: The results indicate that the resource is fully exploited in the Balearic Islands. The fishery is operating at or close to an optimal yield level, with no expected room for further expansion. Moderate fishing mortality and intermediate abundance were estimated. Current Y/R is very close to the maximum and Bnow is about 33.5% of Bvirgin.

RECENT MANAGEMENT ADVICE: No increase the fishing effort. In addition, the 2007 advice was to improve the trawl selectivity should be improved with the implementation of the 40 mm square mesh.

STECF COMMENTS: STECF agrees with the advice of the SAC-GFCM SCSA. The STECF SGMED-08-04 report should be considered.

7.21. Striped mullet (*Mullus surmuletus)* in Geographical Sub Areas 12, 13, 14. Northern Tunisia, Gulf of Hammamet, Gulf of Gabès

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: Striped mullet is one of the two principal species of Mullidae exploited in Tunisia. The mean catches are over the 1950 t, representing 45% of the landings of this family and 3.6% of the production of demersal fishery. Striped mullet is fished all along the Tunisian coast, where many types of fleets (métiers) operate; the principal two are artisanal fishery and bottom trawl.

SOURCE OF MANAGEMENT ADVICE: Two independent stocks of red mullet in Tunisia were identified: one relative to the Northern and Eastern (GSAs 12 and 13) and the other to the Southern part (GSA 14). The two stocks were treated separately. Demographic analysis of *Mullus surmuletus* in Tunisia was made by means of length composition of capture applied to the inshore trawl fishing from 2003 to 2005. The analysis of pseudo-cohort method is used.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: The global fishing mortality rates of the northern and eastern stocks are low; while for the southern stocks, they are moderate. The exploitation profile of north and east trawler and coastal fleet is orientated to mature fish; however, the southern trawlers catch mainly an important fraction of juveniles.

RECENT MANAGEMENT ADVICE: No assessment has been presented to SAC-GFCM Sub-Committee in 2008. The previous recommendation was not to increase the fishing effort.

STECF COMMENTS: STECF has no comments since there is not an updated assessment.

7.22. Red mullet (*Mullus barbatus)* in Geographical Sub Area 1. Northern Alboran Sea

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: Red mullets are of the most important target species for the trawl fisheries but are also caught with set gears, in particular trammel-nets and gillnets. From official data, the total trawl fleet of the geographical sub-area 01 (Northern Alboran Sea region) is composed by about 170 boats: on average, 42 TRB, 60 GT and 197 HP (in 2007). Smaller vessels operate almost exclusively on the continental shelf (targeted to red mullets, octopuses, hake and sea breams), bigger vessels operate almost exclusively on the continental slope (targeted to decapod crustaceans) and the rest can operate indistinctly on the continental shelf and slope fishing grounds. Red mullet is intensively exploited during its recruitment from August to November.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM. The stock has been assessed using data from the trawl fishery on a time series covering three years (2005-2007). A VPA and a Y/R analysis on a mean pseudo-cohort from that period has been carried out using the VIT program (Lleonart and Salat, 1997). The analysis was performed using monthly size composition of catches, official landings and the growth parameters according in the SGMED-08-03 meeting. The vector of natural mortality by age was calculated from Caddy´s (1991) formula.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: In the Alboran Sea (GSA 1), the fishery is mostly concentrated on recruits. Moderately exploited: low level of fishing effort. Believed to have some limited potential for expansion in total production. Moderate fishing mortality and intermediate abundance were estimated in GFCM-SAC 2008. Current Y/R very close to the maximum and Bnow being 21% of Bvirgin. The results from the pseudocohort analysis show that the current stock biomass represents 21% of the virgin stock biomass (SG-MED 08 03). During STECF SGMED 08-04, the results of using SURBA analysis, didn't present good fitness for assessment.

RECENT MANAGEMENT ADVICE: The GFCM-SAC 2008 recommended not increasing the fishing effort. In addition GFCM SAC in 2007, advised:

- A more effective control in closed coastal areas in order to protect recruitment.
- Seasonal closures.
- A more strict control of the legal mesh size.

- To improve the selectivity by the use of 40 mm square mesh size in the cod-end.

STECF COMMENTS: STECF notes that in the absence of reference points the stock status cannot be fully evaluated and no advice can be provided.

7.23. Red mullet (*Mullus barbatus)* in Geographical Sub Area 3. Southern Alboran sea

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: The trawler fleet targeting red mullet in GSA 3 consists of 120 trawlers. Trawler catches are landed mainly in three harbours: Nador (62.6%), Al Hoceima (23.2%) and M'diq (14.2%).

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM. Assessments by structural models were performed using length frequencies data for 2007.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: The stock of red mullet is qualified as overexploited with a fishing mortality which exceeds the optimum of about 30%.

RECENT MANAGEMENT ADVICE: The assessment was considered as preliminary and the GFCM-SAC 2008 didn't give any specific advice.

STECF COMMENTS: STECF has no comments.

7.24. Red mullet (*Mullus barbatus)* in Geographical Sub area 5. Balearic Island, Spain

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: The two species of red mullet inhabiting the Mediterranean, *Mullus surmuletus* and *M. barbatus*, are present in the Balearic Sea. However, *M. surmuletus* predominates in this area where the species is targeted by both the artisanal and trawl fleet working along the continental shelf. On the contrary, *M. barbatus* is caught as a by-catch species by trawlers operating mainly on the deep shelf. In the Balearic Islands, *M. surmuletus* and *M. barbatus* represent about 80% and 20% of the total red mullet catches respectively. During the 2000-2007 period, the landings of *M. barbatus* from Mallorca have ranged between 10.5 and 27.8 tons.

SOURCE OF MANAGEMENT ADVICE: The stock of *Mullus barbatus* of the GSA05 has been assessed using data from the trawl fishery on a time series covering eight years (2000-2007). The assessment has been carried out applying tuned VPA (Extended Survivor Analysis, XSA) on the cohorts present during 2000-2007 and both VPA and Y/R analysis on a mean pseudo-cohort from that period. These approaches were performed using monthly size composition of catches, official landings and the growth parameters accorded in the SGMED-08-03 meeting. Other biological parameters (length-weight relationships, oogive of maturity) were obtained within the framework of the Spanish Data Collection Programme. The VPA was tuned with CPUE from bottom trawl surveys, carried out around the Balearic Sea during 2001–2007.

PRECAUTIONARY REFERENCE POINTS: Precautionary reference points have not been proposed for this stock.

STOCK STATUS: The Current Y/R is very close to the maximum and Bnow being 25% of Bvirgin. XSA gave a more optimistic view on the stock. Fully exploited. The fishery is operating at or close to an optimal yield level, with no expected room for further expansion. Moderate fishing mortality.

RECENT MANAGEMENT ADVICE: SAC-GFCM Sub-Committee 2008:

Not to increase the fishing effort.

STECF COMMENTS: STECF notes that in the absence of reference points the stock status cannot be fully evaluated and no advice can be provided.

7.25. Red mullet (*Mullus barbatus)* in Geographical Sub area 6. Northern Spain

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: Red mullet in GSA 6 (Northern Spain) is .exploited by trawl and artisanal fisheries , althought small gears (trammel nets and gillnets) account only for 5% of the total landings of these species. Landings of *M. barbatus* increased continuously from the earliest 1970's until 1998. From this year until 2006 a general decreasing trend with some fluctuations is observed. In the period 1998-2004 landings of this species averaged 1315 t per year. Estimated landings for the year 2007 are the highest in the data series. An important fraction (30% of individuals) of M. barbatus are under the minimum legal size.

The trawl fleet operating in this area is composed by 647 boats averaging 47 TRB, 58 GT and 297 HP. Trawl fisheries developed along the continental shelf and upper slope are multi-specific. Small vessels operate almost exclusively on the continental shelf targeting on red mullets, octopus, cuttlefish and sea breams. Medium and large vessels usually operates on the slope areas, but some of these units can also operate on the continental shelf (e.g. red mullet is more intensively exploited from September to November).

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM**.** The stock of *Mullus barbatus* in GSA06 has been assessed using data from the trawl fishery on a time series covering ten years (1998-2007). The assessment has been carried out applying tuned VPA (XSA) and Y/R analysis on the pseudo-cohort 1998-2007. The VPA was tuned with CPUE data from MEDITS and LEDER bottom trawl surveys and standardised fleet CPUE by applying GLM model. Size composition of trawl catches form IEO, and the Spanish national Data Collection program and official landings and fleet from fishermen association and Regional Governments.

From 2008 advice is provide also by SGMED.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points were proposed by GFCM-SAC for this stock.

Based on its evaluation of the STECF-SGMED, STECF proposes the following biological reference points for this stock.

F_{max} (Ages 1-3)=	0.24
$F_{0.1}$ (Ages 1-3)=	0.16

STOCK STATUS: GFCM-SAC estimated the stock to be overexploited. The fishery is being exploited at above a level, which is believed to be sustainable in the long term, with no potential room for further expansion and a higher risk of stock depletion/collapse. High fishing mortality and low abundance were observed.

SGMED estimated that since 1998 spawning stock biomass has been estimated to fluctuate around 600 tons. However, there is an estimated increase observed since 2006 with the highest value of 1200 tons in 2007. Recruitments in the last three years are just above the mean recruitment for the period 1998-2004. The fishing mortality for ages 0-2 has fluctuated without any obvious trend since 1998, around 0.9.

RECENT MANAGEMENT ADVICE: The SAC-GFCM Sub-Committee 2008 recommendations were (a) to improve trawl exploitation pattern by enforcing as soon as possible the current legislation (Council EC Regulation Nº 1967/2006) regarding the use of the 40 mm square mesh in the cod-end and by more effective control in shelf areas above 50 m depth, and (b) to reduce the effective fishing effort, by reducing time at sea, from 5 to 4 days per week.

SGMED recommends the relevant fleet efforts to be reduced until fishing mortality is in the range of F0.1-FMAX, in order to obtain high long term sustainable yields.

STECF COMMENTS: STECF endorses the advice of the SGMED 08-04 and GFCM-SAC recommendations that the relevant fleet efforts to be reduced until fishing mortality is in the range of F0.1-FMAX, in order to obtain high long term sustainable yields. STECF also agrees with the GFCM-SAC 2008 concerning proposed technical measures. Alternative scenarios (closed areas and/or seasons) for improving yield should have been evaluated.

7.26. Red mullet (Mullus barbatus) in Geographical Sub Area 9. Ligurian and northern Tyrrhenian Sea

FISHERIES: *Mullus barbatus is* among the most commercially valuable species in the area. It is caught mainly with three different variants of the bottom trawl net. *Mullus barbatus* catches are higher during the post-recruitment period (from September to November). About 350 trawlers and a small number of artisanal vessels exploit the species. Annual landings are around 700 t, mostly from trawlers. Catch is mainly composed by age 0 individuals while the older age classes are poorly represented in the catch. Illegal (undersized) catches of juveniles do occur.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM. From 2008 advice is provided also by SGMED. Data used derive from trawl surveys on size composition and abundance indices, and on landings by size/age and direct fishing effort from commercial catch assessment surveys. LCA with data from 2008 was used for the estimation of the *F* vector, using catches from trawlers and small scale fisheries. Yield per recruit analysis was used for the definition of F_{max} and $F_{0.1}$. A dynamic Biomass Production model (ASPIC) using both a time series from 1994 and 2008 of catch and effort of commercial vessels proceeding from two of the main ports (Viareggio and Porto Santo Stefano) and an abundance index derived from trawl surveys for the same time interval allowed to estimate F_{MSY}, q for each fishery, B_{MSY}, f_{MSY}, and a value of *F* for each year along the time series. SURBA was also used for deriving *F* estimates by year and other features.

PRECAUTIONARY REFERENCE POINTS:

SGMED proposed the following biological reference points for this stock.

$F_{0.1}$ (all exploited ages) = 0.49	from Y/R
F_{max} (all exploited ages) = 0.62	from Y/R
F_{msy} (all exploited ages) = 0.58	target, from catch and effort with ASPIC

STOCK STATUS (according to SGMED assessment): The index of stock abundance from GRUND survey shows high variability throughout the time series, but no trend is observed. The index of abundance from MEDITS survey that approximates a spawning stock biomass index (mostly represented by mature fish), suggests an increasing trend from 1994 to 2008. High inter-annual variation is observed from 2002 to 2008. The current spawning stock biomass roughly estimated through simulations with LCA outputs and yield-per-recruit analysis is assumed to be lower than 20% of the pristine SSB. A 20% spawner survival is considered too low to ensure stock self-renewal. Recruitment shows a slight increasing trend over 2002 -2008 and the increase is more pronounced in the most recent years.

Comparable estimates of the current fishing mortality were obtained with alternative approaches (F2008 = 0.85 with ASPIC, F2006-2008=0.97 with LCA) all of them higher than the values recently estimated for the limit reference points F_{MSY}=0.58 and its proxy $F_{0.1}$ =0.49. These were also higher than the values obtained with a previous biomass dynamics model based on trawl surveys time series of Z and biomass index, that provided a F_{MSY} rate of 0.59 (SGMED-08-03). The stock is considered to be overexploited in relation to F_{MSY}. The size of first capture is too low, resulting in growth overfishing. An increase in yield can be expected if fishing effort is reduced and/or more selective gears are used.

RECENT MANAGEMENT ADVICE: STECF endorses the advice of the SGMED 09-02. SGMED 09-02 proposed $F \leq 0.58$ as target management reference point (basis F_{MSY}). To achieve this, a multi-annual management plan taking into account mixed-fisheries effects should be established. Catches consistent with the effort reductions should be provided. It is advisable to avoid the illegal fishing within the 3 miles zone from the base line as well as the landing of undersized individuals in order to decrease fishing pressure on juveniles.

STECF COMMENTS: STECF endorses the advice from SGMED 09-02. STECF notes that there is no advice provided by GFCM-SAC.

7.27. Red mullet (*Mullus barbatus*) in Geographical Sub Area 10. Southern and central Tyrrhenian

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: *Mullus barbatus is* among the most commercial valuable species in the area and consists partly of a species assemblage that is the target of the bottom trawling fleets, which operate near shore. No commercial catch data and no information on the fleets were reported to the SAC.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM. Trawl survey data comes from MEDITS and SAMED EU projects. The data considered were the indices of abundance (weight and number per square km by swept area method), size composition at sea by sex, sex ratio, maturity, growth, natural and total mortality. The Length frequency analysis, Chen & Watanabe vector, Alagaraja formula, length converted catch curve, simulation of different scenarios using a dynamic pool model were performed.

From 2008 advice is provide also by SGMED.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points were proposed by GFCM-SAC for this stock.

Based on its evaluation of the STECF-SGMED, STECF proposes the following biological reference points for this stock.

$F_{0.1}$ (0-3 years)=	0.37-0.59
F_{max} (age range)=	Not well defined dome shaped curves
F_{msy} (age range)=	
F_{pa} (F_{lim}) (age range)=	
B_{msy} (spawning stock)=	
B_{pa} (B_{lim}, spawning stock)=	

STOCK STATUS: GFCM-SAC estimated the stock to be fully exploited and growth overfishing can be assumed for the species. There are no significant trends in biomass abundance estimates.

SGMED considered that in the absence of proposed or agreed references SGMED is unable to fully evaluate the state of the stock. Survey indices indicate a decreasing pattern of biomass from 1999 onwards. In the recent years (especially in 2007) a rising of stock number and biomass was observed but subject to high variation (uncertainty). The Aladym model shows that, except in the last two years, the SSB was at lower level compared to the beginning of the time series. A similar pattern shows also the spawning potential ratio that was varying around 10% between 1998 and 2005. Long-term scenario was also simulated. The recruitment of recent years since 2003 is indicated to be below average. Considering the level of F in 2006 i.e. 0.7, a reduction of 47% would be necessary to reach F0.1 (0.37). In 2007 the situation seems changed. Despite the value of status quo F (0.65) is close to that of 2007, the exploitation pattern was different and thus a reduction of about 10% would be needed to reach F0.1 (0.59). Given the results of the present analysis, the stock appears to be subject to overfishing.

RECENT MANAGEMENT ADVICE: SAC-GFCM consider that a reduced (total) mortality of 10% – 15% could be achieved by enforcing area and temporal closures currently in place, which, in turn, could lead to a more desirable ratio between average Spawning Stock Biomass and average virgin Spawning Stock Biomass (SSB/SSBo).

SGMED recommends fishing mortality to be reduced to the range between F0.1 and FMSY through effort reductions of the relevant fleets. This requires consideration of the mixed fisheries nature of such fleets.

STECF COMMENTS: STECF endorses the advice of the SGMED 08-04. STECF notes that there is no advice provided by GFCM-SAC.

7.28. Red mullet (*Mullus barbatus)* in Geographical Sub Area 11. Sardinian Sea

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: *Mullus barbatus is* among the most commercially important species in the area and forms part of an assemblage that is the target of the bottom trawling fleets, which operate near shore. From 1994 to 2004, in GSA 11, the trawling-fleet has remarkably changed. The change has mostly consisted of a general increase of

the number of vessels and by the replacement of the old, low tonnage wooden boats by larger steel boats. For the entire GSA a decrease of 20% for the smaller boats (<30 GRT), which principally exploit this species, was also observed.

SOURCE OF MANAGEMENT ADVICE: The data refer to trawl surveys carried out between 1994 and 2004. For the same years the commercial data was also analysed. Density and biomass indexes were used. Y/R analysis was performed as a function of F and tc. Assessment was performed considering both the whole GSA 11 and different zones with different exploitation levels.

PRECAUTIONARY REFERENCE POINTS: The analyses made using the Beverton & Holt model proved to be useful in identifying the value of F_{max} as Limit Reference Point. For a more cautious assessment, however, the value of F 0.1 seems to be a good Target Reference Point.

STOCK STATUS: The renovation of fishing vessels led to a great increase in the number of bigger boats (total gross tonnage, TGT>70) and consequently a shift of the fishing effort towards deep resources: this favoured all the species living in shallow waters, such as red mullet. In Sardinian waters abundance and density indices of *Mullus barbatus* have markedly increased in the last years, particularly in the southern area where a significant trend is detected. Commercial catch rates and total landings have remained relatively constant since the mid 1990s. In general, the Sardinian red mullet stock does not seem to suffer from overexploitation: in the different zones, characterized by different trawling surfaces, wind exposition, bottom features and levels of exploitation, fishing mortality rates exceeded the estimated F_{max} only in some of the years analyzed.

RECENT MANAGEMENT ADVICE: Management actions such as the enforcement of a mesh size of 40 mm, a "seasonal fishing ban" on fishing activities and more active surveillance of Essential Fish Habitats (EFHs) could lead to a reduced mortality of the younger cohorts and help to safeguard juveniles. Protection areas play an additional important role in safeguarding recruits and juveniles from overexploitation.

STECF COMMENTS: STECF notes that no new assessment has been done since 2006 in GFCM-SAC.
STECF has no comments.

7.29. Red mullet (*Mullus barbatus)* in Geographical Sub Area 17. Adriatic Sea

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: The fishery for red mullet is one of the most important in the GSA 17. Fishing grounds correspond to the distribution of the stock particularly within 100 m depth. The allocation of fishing effort depends on the different life cycles of this species and the different concentration and distribution in GSA 17.

The Italian catch of red mulled in GSA 17 is obtained mostly by demersal otter trawl, but other gears are participating at the fishery for a very minor fraction of the catch. Demersal trawl landings ranged between 77% to 98.6% in the years 2002-2007.

Catches in recent years were reported at a level of 3,098 t in 2002; 3,111 t in 2003; 3,884 in 2004; 3,696 in 2005 and 3,226 in 2006. In 2007, red mullet catches accounted for 3,425 t.

SOURCE OF MANAGEMENT ADVICE: From 2008 advice is provide by SGMED.

PRECAUTIONARY REFERENCE POINTS: Based on its evaluation of the STECF-SGMED, STECF proposes the following biological reference points for this stock.

$F_{0.1}$ = 0.50	Average for the time interval 2006-2007, calculated using F not weighted on abundance for the length interval 9-20+ cm (age from 0 to 3+).
F_{max} (age range)=	
F_{msy} (age range)=	
F_{pa} (F_{lim}) (age range)=	
B_{msy} (spawning stock)=	
B_{pa} (B_{lim}, spawning stock)=	

STOCK STATUS: SGMED estimated that the average stock biomass in 2006-2007 was around 4000 tonnes. There is no information available on recruitment. The average F not weighted on abundance was 1.08 while the

weighted average F was 0.62. The corresponding exploitation rates were 0.63 and 0.50, respectively. Given the values of F and F/Z (the latter one equal to or higher than 0.50) the stock can be considered to be sustainably exploited with some risk of overexploitation. According to Rochet and Trenkel (2003), it would be safe to avoid F/Z higher than 0.50. Also, the seasonality fishing mortality of red mullet (from September to November) has to be taken into account.

RECENT MANAGEMENT ADVICE: In order to reduce the risk of overfishing, SGMED recommends fishing mortality to be reduced through effort reductions of the relevant fleets. This requires consideration of the mixed fisheries nature of such fleets.

STECF COMMENTS STECF endorses the advice of the SGMED 08-04. STECF notes no advice was provided by GFCM-SAC.

7.30. Red mullet (*Mullus barbatus)* in Geographical Sub Area 19. Western Ionian Sea

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: *Mullus barbatus* is among the species with high commercial value. The highest trawl fishing pressure occurs along the Calabrian coast while the presence of rocky bottoms on the shelf along the Apulian coast prevents the fishing by trawling in this sector. The landings in the 2004 in the whole GSA 19 were detected around 321 t coming mainly from bottom trawling and small-scale boats.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM. Systematic studies on this demersal resource come from national research programs (GRUND) and international trawl surveys (MEDITS), as well as Catch Assessment Surveys (CAMPBIOL) that include data collection of size/age structure of the catches. Density and biomass indexes, length frequency distributions, growth parameters, length converted catch curve analysis to estimate total mortality (Z), Pauly's formula for natural mortality (M) and yield-per-recruit analysis were used to assess the status of the stock in the area, as well as simulations of changes of t_c and F. Series data of abundance indexes, average length and total mortality rates from 1994 to 2004 were produced.

PRECAUTIONARY REFERENCE POINTS: Precautionary reference points have not been proposed for this stock.

STOCK STATUS: *Mullus barbatus* shows a moderate status of overfishing evaluated by means of yield per recruit models. However, no significant decline in catch rates from experimental surveys can be detected.

RECENT MANAGEMENT ADVICE: Enforcement of the legal minimum mesh size in the trawl net and improved control of illegal fishing in very shallow waters during the recruitment period should be ensured. The closed season during the late summer-early autumn should be maintained in order to reduce the fishing mortality on the juveniles.

STECF COMMENTS: STECF notes that no new assessment has been done since 2006 in GFCM-SAC. STECF has no comments.

7.31. Red mullet (*Mullus barbatus)* in Geographical Sub Area 25. Cyprus

FISHERIES: Red mullet in GSA 25 is exploited by the bottom otter trawlers and the artisanal fleet using trammel nets. The average percentage of *M. barbatus* in the overall landings of the bottom trawl and artisanal fishery, for the period 2005-2008, was 7% and 2% respectively. Between 1985-2008 there was a declining trend in the landings from both gears, mostly from the trammel nets (total landings in 2007 were <40 t). LPUE of both fleets show a declining trend until 2006; since then, LPUE for the artisanal seems to be stable, while for the bottom trawl fishery LPUE in 2007 reached the highest value of the time period. It is noted that since 2006 the number of licensed bottom trawlers operating in GSA 25 has been reduced by 50% (from 8 to 4).

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM. From 2009 advice is provided also by SGMED. The present assessment was performed by means of VPA analysis, using a mean pseudo-cohort from catch-at-age data for the period of 2005-2008. A Yield per Recruit (Y/R) Analysis was also performed for the estimation of F_{max} and $F_{0.1}$. The VIT software was used for both analyses. Catch-at-age data derived from landings for each fishing gear exploiting the stock (bottom otter trawl and trammel net), and discards data from bottom otter trawl. An M vector was used as estimated by PROBIOM. The biological

data used were collected within the framework of the Cyprus National Data Collection Programme and submitted under the 2009 Spring Official EC Data Call.

PRECAUTIONARY REFERENCE POINTS:

Table of limit and target management reference points or levels proposed by SGMED:

$F_{0.1}$ (1-3)=	0.22
F_{max} (1-3)=	0.34

STOCK STATUS (according to SGMED assessment): In the absence of proposed or agreed precautionary reference points, SGMED 09-02 was unable to fully evaluate the status of the spawning stock size. In the presented stock assessment no trend in the spawning stock biomass was evident. SGMED-09-02 was unable to provide any scientific advice of the state of the recruitment as no trend in recruitment was evident. The estimated reference points of $F_{0.1}$ (0.22) and F_{max} (0.34), in relation with the estimated value of $F_{bar\ (1-3)}$ (=0.84), sugggested an overexploitation state of the stock.

RECENT MANAGEMENT ADVICE: SGMED 09-02 recommends a reduction in fishing effort of the relevant fleets until sustainable levels of fishing effort are achieved ($F \leq 0.22$). This shoud be done by means of a multi-annual management plan taking into account mixed fisheries implications. Short- and medium-term predictions of catch and stock biomass consistent with a range of effort changes should be provided.

STECF COMMENTS: STECF endorses the advice from SGMED 09-02. STECF notes that no advice has been provided by GFCM-SAC.

7.32. Hake (*Merluccius merluccius)* in Geographical Sub Area 1. Northern Alboran Sea

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: Hake (*Merluccius merluccius*) is one of the most important target species for the trawl fisheries. In the GSA 1 there are 140 trawlers landing around 400 tonnes by year, mainly composed by juveniles living on the continental shelf.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is GFCM-SAC but no new assessment was presented to subgroups of this committee in 2008.

From 2008 advice is provide also by SGMED.
PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: SGMED reported that transition analysis was made reducing the fishing effort by 20% and using 40 mm square mesh size. The results showed that the increase in Y/R was higher after improving the selectivity than reducing fishing effort. There were gains in the second year after the application of this management measure. The stock status was considered under a growth overexploitation. Current level of B is very low compared to $B_{0.}$
SGMED could not estimate the absolute levels of stock abundance. Survey indices indicate the stock to vary without an overall trend, and in 2008 the stock SSB appears to be at an average level compared with the last 13 years. SGMED could not estimate the absolute levels of recruitment. Survey indices in 2008 indicate the recruitment level to be above the average of the available time series. SGMED cannot estimate recent or historic exploitation rates. No proposed or agreed reference points were available to SGMED to identify stock status.
The continued lack of older fish in the surveyed population indicates exploitation rates far beyond those considered consistent with high yields and low risk of fisheries collapse. However, SGMED note that the survey gear is not specifically designed to sample larger older fish.

RECENT MANAGEMENT ADVICE: The 2004 SAC WG noted that there are differences in the exploitation pattern in the different GSAs although the stock can be considered as one unit. The need for sensitivity analysis and for an update of the growth and mortality parameters was raised, as well as the need to monitor discards mainly in GSA 1 and in the future to move to non equilibrium assessments. Assessments including also trawl survey data were encouraged.

The GFCM recommended:
• to improve the selectivity: in comparison with the 40-mm diamond mesh size the use of 40-mm square mesh size is more effective and
• to control the effort on the main nursery areas.

The GFCM, taking into account that the stock was heavily overexploited and that the biomass was very low in comparison with the virgin one, highlighted the necessity of both improving the selectivity and reducing the fishing effort.

No new assessment has been presented in SAC-GFCM Sub-Committee on Stock Assessment (SCSA) in 2008. The first approach with SURBA analysis (MEDITS historical data base 1994-2007) has been developed and the assessment rejected. The results indicated that further investigation into the age structure estimated from the survey data is needed, as the model appears unable to fit to the data at present.

Given information available, SGMED could not provide projections of future stock status and catch possibilities.

STECF COMMENTS: STECF has no comments.

7.33. Hake (*Merluccius merluccius)* in Geographical Sub Area 5. Balearic Islands

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: The trawl fishery off Mallorca (Balearic Islands; GSA05) is operated by around 40 vessels, which total annual landings are approximately 1400 tons. The European hake (*Merluccius merluccius)* is a target species for this fishery, mainly exploited on the deep shelf and upper slope, with annual landings oscillating between 50 and 190 tons during the last decades.

SOURCE OF MANAGEMENT ADVICE: The information used for the assessment of the stock consisted in annual size composition of catches, official landings biological parameters estimated from 2003-2007. The vector of natural mortality by age was calculated from Caddy´s formula. The methodology applied was: (i) a tuned virtual population analysis (VPA), applying XSA method on the period 1980-2007 and considering catch per unit effort (CPUE) from commercial trawl fleet (2000-2007) and bottom trawl surveys (2001-2007) as tuning fleets; (ii) a surplus production model for the period 1940-2004, considering annual landings and engine power (HP) to estimate CPUE; and, (iii) a VPA and yield per recruit (Y/R) analysis on a mean pseudocohort from the periods 1980-89, 1990-99 and 2000-07.

From 2008 advice is provide also by SGMED.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock. The SAC-GFCM Sub-Committee on Stock Assessment (SCSA) recommended to prepare a list of reference points and indicators for the next WG.

STOCK STATUS: SAC-GFCM considered that the hake stock in GSA 05 is fully exploited. The fishery is operating at or close to an optimal yield level, with no expected room for further expansion. The fishing mortality was moderate and the abundance intermediate.

SGMED reviewed the assessment results, and considered them incompatible with true population dynamics.

SGMED therefore noted that the hake 'population' of GSA 05 is unlikely to be independent from that of the adjacent GSA 06. SGMED therefore recommends exploring the alternative of merging data from GSA 05 and GSA 06 and perfoming a single assessment for both GSAs together.

RECENT MANAGEMENT ADVICE: The SAC-GFCM Sub-Committee 2008 on Stock Assessment (SCSA) recommended not to increase the fishing effort and to enforce as soon as possible the replacement of 40 mm diamond mesh in the bottom trawl cod-end by 40 square mesh. It could improve the exploitation pattern of this species and reduce the discards.

SGMED was unable to provide management advice for this stock.

STECF COMMENTS: STECF notes that in the absence of reference points the exploitation status of the stock cannot be fully evaluated and advice cannot be provided. Based on its evaluation of the report of the STECF

SGMED-08-04 Working Group, STECF considers that the 2008 assessment results are incompatible with true population dynamics.

STECF notes that the hake 'population' of GSA 05 is unlikely to be independent from that of the adjacent GSA 06 and recommends that a combined assessment for hake for GSA 05 and GSA 06 be explored.

7.34. Hake (*Merluccius merluccius)* in Geographical Sub Area 6. Northern Spain

FISHERIES: Exploitation is based on very young age classes, mainly 0 and 1 year old individuals, with immature fish dominating the landings. In 2003-2008 the annual landings of this species were around 3,500 tons. From official data, the total trawl fleet of GSA 06 is made up by 647 boats. The smaller vessels operate almost exclusively on the continental shelf, the bigger ones operate almost exclusively on the continental slope, while the remaining ones can fish indistinctly on the continental shelf and slope fishing grounds, depending on season, weather conditions, and economic factors.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM. From 2008 advice is also provided by SGMED. The state of exploitation was assessed for the period 1995-2008 by means of a VPA Separable, tuned with standardised CPUE from abundance indices from trawl surveys (MEDITS).

PRECAUTIONARY REFERENCE POINTS: SGMED proposed the following reference points: B_{lim}=2,200 t, B_{pa}=4,000 t, $F_{0.1}$ (age classes 0-2) = 0.16, and F_{max} = 0.23.

STOCK STATUS: The general results are similar to those obtained in previous assessments. Exploitation is based on very young age classes, mainly 0 and 1 year old individuals, with immature fraction dominating the landings. Since 2006, SSB has increased from historical lows and has varied slightly above average. SSB was estimated to around 1,500 t in 2008. Recruitment was low in recent years and decreased to the lowest level in 2008. Fishing mortality fluctuated without a trend. It was estimated at 1.6 (F_{bar}) for age classes 0-2 and 1.5 for age classes 2-4. Estimated $F_{0.1}$ and F_{max} were 0.16 and 0.23 respectively. SGMED notes that the SSB level is significantly below the proposed reference points and the F values are higher than the proposed $F_{0.1}$ and F_{max}, concluding that the stock is heavily over-exploited, with future catches being highly dependent on incoming recruitment.

RECENT MANAGEMENT ADVICE: SGMED recommends the fishing effort to be reduced until fishing mortality is below or at the proposed level $F_{0.1}$, This should be achieved by means of a multi-annual management plan taking into account mixed-fisheries effects. Short- and medium-term predictions of catch and stock biomass consistent with a range of effort changes should be provided. STECF notes that this advice is consistent with the advice provided by GFCM-SAC.

STECF COMMENTS: STECF recognizes that the hake stock in GSA 6 is overexploited and endorses the SGMED advice to reduce fishing mortality on age groups 0-2 towards F-0.16 to allow the spawning stock to rebuild. STECF also recommends that short and medium term projections be undertaken during the next SGMED meeting (SGMED 09-03) scheduled for December 2009.

7.35. Hake (*Merluccius merluccius)* in Geographical Sub Area 7. Gulf of Lions

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: Hake (*Merluccius merluccius*) is one of the most important demersal target species of commercial fisheries in the Gulf of Lions (GFCM GSA 7). In this area, hake is exploited by French trawl, French gillnet, Spanish trawl and Spanish long-line. Around 250 boats are involved in the fishery. According to the official statistics the total annual landings for the period 1998-2007 have oscillated around a mean value of 2135 tons (1704 tons in 2007). Most fleets and catches correspond to French trawl (49 and 70%, respectively). Trawl catches range between 3 and 92 cm total length (TL), with an average size of 17-23 cm TL, followed by French gillnet (~32 and 15% respectively, ranging 13-86 cm TL and average size 38-41 cm TL), Spanish trawl (~12 and 8%, respectively, ranging 5-87 cm TL, and average size 20-29 cm TL), and Spanish long-line (~7 and 7%, respectively, ranging 23-96 cm TL and average size 46-62 cm TL).

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM. The information used for the assessment of the stock consisted in annual size composition of catches (estimated from monthly or

quarterly sampling in the main landing ports), official landings and biological parameters estimated by Aldebert and Recasens (1996). The growth coefficient (k) comes from first results of tagging experiments developed by IFREMER in the area. The vector of natural mortality by age was calculated from Caddy´s formula. For the period of the study (1998-2007), 2 methodologies were applied. The first one is a tuned virtual population analysis (VPA), applying the Extended Survivor Analysis (XSA) method considering, as tuning fleets, catch per unit effort (CPUE) of commercial fisheries (French trawl, Spanish trawl and Spanish long-line) and French MEDITS survey indices. The second method is a length cohort analysis (LCA) and yield per recruit (Y/R) analysis on a mean pseudo-cohort from the period of study.

From 2008 advice is provide also by SGMED.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points were proposed by GFCM-SAC for this stock.
Based on its evaluation of the STECF-SGMED, STECF proposes the following biological reference points for this stock.

$F_{0.1}$ (age range) =	0.22
F_{max} (age range) =	n.a.
F_{msy} (age range)=	0.3
F_{pa} (F_{lim}) (age range)=	n.a.
B_{msy} (spawning stock)=	n.a.
B_{pa} (B_{lim}, spawning stock)=	n.a.

STOCK STATUS: GFCM-SAC estimated that fishing mortality high. There is growth overexploitation with a risk of recruitment overexploitation. A declining trend in recruitment was detected. Decreasing trend in average SSB and recruitment. The analysis shows that an acceptable reference point could be an F value of 0.6 (this means a reduction of 20% of current F value) which would allow to double the SSB/R.

SGMED estimated that since 1998 spawning stock biomass has varied without a trend and is estimated to amount 2300 tons in 2007. In the absence of proposed or agreed references SGMED is unable to fully evaluate the state of the stock. Since 2003 the estimated recruitment is below average. Fishing mortality of ages 0-2 has decreased in 2004 and has been stable around 0.7 since then. This level of fishing mortality exceeds proposed references of F0.1 and FMSY, and thus SGMED considers the stock being subject to overfishing.

RECENT MANAGEMENT ADVICE: The management advice by the SAC-GFCM Sub-Committee 2008 on Stock Assessment (SCSA):

To reduce growth overfishing and reduce the risk of recruitment overfishing,

This objective can be reached by:

- reducing the effort of trawlers, long-liners and gill-netters (reducing time at sea, number of fishing boats, engine power, Bollard pull and/or trawl size…).
- improving the fishing pattern of trawl so as to ensure that the minimum length of catches equal the minimum legal landing size, by: (i) Enforcing as soon as possible at least the 40 mm square mesh cod-end, and (ii) Closing nursery areas, at least temporally (possibly identified by trawl surveys), i.e. protecting spawning by closing areas (identified from VMS data particularly on gill-netters and long-liners), at least temporally during the period of maximum spawning (winter and spring).

SGMED recommends fishing mortality being reduced to the range of F0.1 and FMSY, through consistent effort reductions. This requires the mixed fisheries nature of the relevant fleets to be considered.

STECF COMMENTS: STECF endorses the advice of the SGMED 08-04.. STECF also agrees the recommendations the SAC-GFCM Sub-Committee on Stock Assessment (SCSA) concerning technical measures.

7.36. Hake (*Merluccius merluccius)* in Geographical Sub Area 9. Northern Tyrrhenian

FISHERIES: Hake is the demersal species providing the highest landings and incomes in GSA 09. About 90% of the landings come from bottom trawling; the remaining 10% being caught by artisanal vessels using gillnets.

The fleet fishing capacity of GSA 09 has gradually decreased in the last 20 years, with a 30% reduction of the number of bottom trawlers from 1996 to 2006. In the last five years the total landings of hake fluctuated between 1,200 and 2,300 t, amounting to 1,329 t in 2008.

Due to the large concentration of juveniles in GSA 09, trawl landings are traditionally dominated by small sized specimens belonging to age groups 0+ and 1+. Gillnet fishery lands mostly age 2 and 3 fish. High quantities of small size hake are routinely discarded. Around 450 t. of hake discards were estimated in 2006 for the trawl fishery in GSA 09.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM. From 2008 advice is also provided by SGMED. Data coming from MEDITS (1994-2008) and GRUND (1994-2004) trawl surveys were used to estimate relative SSB and F with Surba. Data coming from DCR for the period 2006-2008 were used to run LCA analyses.

PRECAUTIONARY REFERENCE POINTS: The candidate reference points for long term sustainability proposed by SGMED were F0.1 = 0.2 and Fmax = 0.4.

STOCK STATUS: SSB is estimated to be in the region of 5-10% of the SSB at Fmax. SGMED underlines that this result could be biased by the observed exploitation patterns in surveys and fisheries, which almost exclusively cover the juvenile part of the stock. In recent years recruitment has varied without a clear trend. The estimated F is 1.2-1.7, far higher than the proposed reference points. SGMED concluded that the hake stock in GSA 9 appears to be heavily overexploited but due to the high productivity in terms of incoming year classes, it could have the potential to recover quickly if F is reduced towards F0.1.

RECENT MANAGEMENT ADVICE: SGMED recommends the fishing effort to be reduced until fishing mortality is below or at the proposed level $F_{0.1}$. This should be achieved by means of a multi-annual management plan taking into account mixed-fisheries effects. Short- and medium-term predictions of catch and stock biomass consistent with a range of effort changes should be provided.

STECF COMMENTS: STECF recognizes the state of overexploitation of the hake stock in GSA 9 and endorses the recommendation of SGMED 09-02 and GFCM-SAC. STECF also recommends that short and medium term projections be undertaken during the next SGMED meeting (SGMED 09-03) scheduled for December 2009.

7.37. Hake (*Merluccius merluccius)* in Geographical Sub Area 10. Southern and Central Tyrrhenian Sea

FISHERIES: Landings of hake increased from 1,012 t in 2002 up to 1,544 t in 2006, and then decreased until to reach 1,122 t in 2008. The overall fishing effort decreased from 2002 up to date, especially for a reduction of small scale fishery.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM. From 2008 advice is also provided by SGMED. The state of exploitation was assessed for the period 1998-2008 by means of SURBA and ALADYM models and using data from trawl surveys as well as landing and effort data.

PRECAUTIONARY REFERENCE POINTS: SGMED proposed the following management reference point: $F_{0.1} \leq 0.24$

STOCK STATUS: SGMED was unable to advice on the state of the spawning stock size. However, considering that the F level estimated in 2008 (0.55) is higher than the reference $F_{0.1}$ and F_{max} values, SGMED concluded that the stock appears overfished and a reduction of 55% would be necessary to reach $F_{0.1}$ (0.24).

RECENT MANAGEMENT ADVICE: SGMED recommends the fishing effort to be reduced until fishing mortality is below or at the proposed $F_{0.1}$ level. This should be achieved by means of a multi-annual management plan which should take into account mixed-fisheries effects. Catches consistent with the effort reductions should be estimated.

STECF COMMENTS: STECF endorses the SGMED advice to reduce F towards $F_{0.1}$. STECF recommends that short and medium term projections be undertaken during the next SGMED meeting (SGMED 09-03) scheduled for December 2009. STECF notes that there is no advice provided by GFCM-SAC.

7.38. Hake (*Merluccius merluccius)* in Geographical Sub Area 11. Sardinian Sea

FISHERIES: Hake is exploited in all trawlable areas around Sardinia and is one of the most important target species for bottom trawlers. The catches of trammel nets or long-lines are negligible. Small hakes are commonly caught from 50 m up to 300 m depth, whereas adults are caught up to 800 m. Trawl fleet in 2006, accounted for 157 vessels (11.7% of the overall Sardinian fishing fleet). The total landings of hake strongly increased from 361 t in 2002 to 897 t in 2003, remained practically constant until 2006, and then decreased to 550 t in 2007.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM. From 2008 advice is also provided by SGMED. The SURBA software was used to analyse the MEDITS time series and to estimate relative SSB and F. DCR data of the years 2006-2007 were used to run stock analyses.

PRECAUTIONARY REFERENCE POINTS: The reference points $F_{0.1}$ and F_{max} estimated for this species by SGMED were 0.17 and 0.25, respectively.

STOCK STATUS: SGMED was not able to estimate the absolute levels of stock biomass and recruitment. SGMED notes that the current F (F_{1-3}=1.0-2.3) is far in excess of the proposed target reference point $F_{0.1}$ and also exceeds F_{max}., SGMED concludes that the stock is heavily overfished.

RECENT MANAGEMENT ADVICE: SGMED recommends the fishing effort to be reduced until fishing mortality is below or at the proposed level $F_{0.1}$. This should be achieved by means of a multi-annual management plan taking into account mixed-fisheries effects. Catches consistent with the effort reductions should be provided.

STECF COMMENTS: STECF endorses the SGMED advice. STECF recommends that short and medium term projections be undertaken during the next SGMED meeting (SGMED 09-03) scheduled for December 2009.
STECF notes that there is no advice provided by GFCM-SAC.

7.39. Hake (*Merluccius merluccius)* in Geographical Sub Area 15 -16. Strait of Sicily

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: Although hake is not a target of a specific fishery, it is the third species in terms of biomass of Italian yield in the area. Hake is caught mostly by trawlers in a wide depth range (50-500m) together with other important species such as *Nephrops norvegicus, Parapenaeus longirostris, Eledone spp., Illex coindetii, Todaropsis eblanae, Lophius spp., Mullus spp., Pagellus spp., Zeus faber, Raja* spp among others. Italian trawlers, based in the harbours along the southern coasts of Sicily, operate both in GSA 15 and 16 with exclusion of Maltese Fishing Management Zone (MFMZ). Italian trawlers exert most of the fishing effort and get more than 99% of hake catches in the entire area.
In the late nineties Sicilian trawlers fishing off-shore (15–25 days of trip) had higher discard rates of hake (86% in number and 31% in weight) than the inshore trawlers (1-2 days trips) (32% in number and 9% in weight). More recent data showed that discarded fraction of undersized hakes by Sicilian trawlers decrease (13% in number and 3% in weight in 2006), amounting to about 54 tons in 2006. The trends in fishing effort of otter trawl fleet increased from 2004 to 2007 by 12%.
Hake is caught by Italian and Maltese fleets, by several gears, including demersal trawls, bottom longlines, polyvalent passive gears and others. Demersal trawlers account for the large majority of the catches, ranging between 91.6% to 98.9% in the years 2002-2007.
Catches of hake in recent years were reported at a level of 1,873 t in 2002; 2,013 t in 2003; 1,949 in 2004; 1,796 in 2005 and 1,632 in 2006. In 2007, hake catches accounted for 1,728 t.

SOURCE OF MANAGEMENT ADVICE: In 2008 advice is provided by SGMED and GFCM-SAC.

PRECAUTIONARY REFERENCE POINTS: Based on its evaluation of the STECF-SGMED, STECF proposes the following biological reference points for this stock.

$F_{0.1}$ (1-4)= 0.16	Females;(TRP)
F_{max} (1-4)= 0.25	Females; (LRP)
Fmsy (age range)= not available	
Fpa (Flim) (age range)= not available	
Bmsy (spawning stock)= not available	
F_{mbp} (1-4)=0.39	Sex combined; (LRP)
Z_{mbp} (1-4)= 0.87	Sex combined; (LRP)

STOCK STATUS: SGMED estimated that relative indices derived from scientific surveys indicate a recent decrease in the stock size in both GSAs since 2005. In 2007, the stock spawning stock size in weight (only GSA 16) amounted to 136% as compared to the long term average (1994-2006). However analytical assessments (Aladym Model) evaluated the spawning stock to be very low when compared with estimated virgin biomass, implying negative effects on stock productivity. Medits results indicate the level of recent recruitment to be increased significantly. The average fishing mortality of hake in GSA 15 and 16 over ages older than 4 could not be precisely assessed. Trends in the average fishing mortality over ages 1 to 4 derived from scientific surveys indicate a recent increase in the exploitation rate since 2003. No relevant differences in F between GSA 15 and 16 are evident. The continued low abundance of adult fish in the surveyed population and catches indicate a very high exploitation pattern far in excess of any fishing mortality consistent with high yields and low risk of fisheries collapse. Considering more in detail the GSA 16, for which both commercial and trawl surveys data are available, all the stock assessments performed during the SGMED suggest quite similar diagnosis of overfishing.

RECENT MANAGEMENT ADVICE: SGMED recommends developing and implementing a management plan to continuously reduce current F through consistent effort reductions and catch estimations.

STECF COMMENTS: STECF endorses the advice of the SGMED 08-04 and agrees with the advice provided by GFCM-SAC.

7.40. Hake (*Merluccius merluccius)* in Geographical Sub Area 17 Adriatic sea

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: The Italian catch of Hake in GSA 17 is obtained mostly by demersal otter trawl, but other gears are participating at the fishery for a very minor fraction of the catch. Demersal trawlers account for the large majority of the catches, ranging between 88.7% to 95.8% in the years 2002-2007.
Catches of hake in recent years were reported at a level of 2,637 t in 2002; 2,606 t in 2003; 3,045 in 2004; 3,609 in 2005 and 4,395 in 2006. In 2007, hake catches accounted for 3,764 t.

SOURCE OF MANAGEMENT: From 2008 advice is provided by SGMED.

PRECAUTIONARY REFERENCE POINTS: Based on its evaluation of the STECF-SGMED, STECF proposes the following biological reference points for this stock.

$F_{0.1}$ = 0.22	Average for the time interval 2006-2007, calculated using F not weighted on abundance for the length interval 9-39+ cm (age from 0 to 4+).
F_{max} (age range)=	
F_{msy} (age range)=	
F_{pa} (F_{lim}) (age range)=	
B_{msy} (spawning stock)=	
B_{pa} (B_{lim}, spawning stock)=	

STOCK STATUS: SGMED estimated that the average stock biomass estimated by LCA in 2006-2007 was around 4,000 tonnes. Without any biomass reference proposed or agreed, SGMED is unable to fully evalute the state of the stock size. There are no information available on recruitment. The recent average F not weighted on abundance was 1.22 while the weighted average F was 0.50. Given the values of F and F/Z (the latter one higher than 0.50), the stock of hake can be considered to be at least fully exploited. According to Mertz and Myers (1998), F/Z = 0.80 represents the maximum value which a demersal stock may endure, and the highest estimated value of F/Z (that based on unweighted F) was just slightly lower than 0.80. According to Rochet and Trenkel (2003), it would be safe to avoid F/Z higher than 0.50: the estimated value of F/Z based on weighted F was slightly lower than 0.60. Thus, a risk of overexploitation is real for hake in the GSA 17. Finally, a meaningful percentage of caught hake has a length below the values of sexual maturity: this is a further reason for caution in managing this stock.

RECENT MANAGEMENT ADVICE: In order to avoid the indicated risk of overexploitation for hake in GSA 17 SGMED recommends effort reductions of the relevant fleets to be considered. Effort reductions would

require mixed fisheries considerations. A significant percentage of caught hake has a length below the values of sexual maturity: this is a further reason for caution in managing this stock.

STECF COMMENTS: STECF endorses the advice of the SGMED 08-04. STECF notes that there is no advice provided by GFCM-SAC.

7.41. Hake (*Merluccius merluccius)* in Geographical Sub Area 18. Southern Adriatic Sea

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: *Merluccius merluccius* is one of the most important species in the Geographical Sub Area 18 representing more than 20% of landings from trawlers. Trawling represents the most important fishery activity in the southern Adriatic Sea and a yearly catch of around 30,000 tonnes could be estimated for the last decades. Demersal species catches are landed on the western side (Italian coast) and the eastern side (Albanian coast), with an approximate percentage of 97% and 3%, respectively. Trawling is the most important fishery activity on the whole area (≅ n° 900 boats, 60% of total number of fishing vessels; 85% of gross tonnage). The Mediterranean hake is also caught by off-shore bottom long-lines, but these gears are utilised by a low number of boats (less than 5% of the whole South-western Adriatic fleet).

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM. Data sources were trawl-surveys (national and MEDITS programmes) as well as Catch Assessment Surveys that included data collection of size structure of the catches.

PRECAUTIONARY REFERENCE POINTS: Precautionary reference points have not been proposed for this stock.

STOCK STATUS: The trend of abundance indices highlighted a decrease from 1996 to 2003, while a slight increase was reported for 2004 and 2005. Most of the assessment carried out previously in the basin using data from trawl surveys and analytical methods underlined an overexploitation of the stock although no clear trend in Z values has been reported. The decreasing trend of index of relative biomass of the hake appeared mostly related to the adult fraction of the population, while the recruitment consistence seemed to be quite stable. Some possible causes of such a decrease could be linked to the fishing mortality exerted on large individuals by bottom long-liners and/or the increase of demersal fishing effort in the eastern Adriatic sector since 1990.

STECF COMMENTS: The STECF notes that no new assessment has been presented to the SAC-GFCM Sub-Committee on Stock Assessment (SCSA) since 2006.

7.42. Hake (*Merluccius merluccius)* in Geographical Sub Area 19. Western Ionian Sea

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: *Merluccius merluccius* is one of the most important species in the GSA 19, considering both the amount of catch and the commercial value. It is fished with different strategies and gears (bottom trawling and long-line). In the year 2004 the landings in the Ionian area were detected around 850 tonnes (IREPA data). The main fisheries operating in GSA 19 are Gallipoli, Taranto, Schiavonea and Crotone. The fishing pressure varies between fisheries and fishing grounds.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM. Systematic studies on this demersal resource come from national research programs (GRUND) and international trawl surveys (MEDITS), as well as from Catch Assessment Surveys (CAMPBIOL) that include data collection of size/age structure of the catches. Density and biomass indexes, length frequency distributions, growth parameters, length converted catch curve analysis to estimate total mortality (Z), Pauly's formula for natural mortality (M) and yield-per-recruit analysis were used to assess the status of the stock in the area as well as simulations of changes of t_c and F. Data series of abundance indexes, average length and total mortality rates from 1994 to 2004 were produced.

PRECAUTIONARY REFERENCE POINTS: Precautionary reference points have not been proposed for this stock.

STOCK STATUS: Although yield per recruit models showed an overexploitation condition, since the bulk of the catches were made up of juveniles, no significant trend of reduction in the catches was observed. Indeed, the trawl net does not catch adequately the adult fraction of the stock which, instead, is mostly captured by long-line.

RECENT MANAGEMENT ADVICE: The reduction of fishing mortality could be obtained by adopting the reduction of fishing activity in the nursery areas distributed along the Ionian Sea. In this respect, "no-take zones" (ZTB) should be adopted in the GSA 19.

STECF COMMENTS: The STECF points out that no new assessment has been presented to the SAC-GFCM Sub-Committee on Stock Assessment (SCSA) since 2006.

7.43. Sole (*Solea solea)* in Geographical Sub Area 17. Northern and Middle Adriatic

FISHERIES: Sole (*Solea solea*) is one of most important target species of rapido trawl and set net fleets in GSA 17. The stock is shared between the Adriatic countries (Italy, Croatia and Slovenia). The Italian fleets exploit this resource with rapido trawl and set nets (gill nets and trammel nets), while only trammel net is used in the countries of the eastern coast. More than 90% of the catches come from the Italian side.

Landings fluctuated between 1,000 and 2,300 t in the period 1996-2006 (data source: FAO-FishStat and IREPA-SISTAN time series). The fishing effort applied by the Italian rapido trawlers gradually increased from 1996 to 2005, and slightly decreased in the last years.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM. From 2009 advice is provided also by SGMED. This assessment (SGMED) is based on VPA (XSA) methods. A separable VPA was also run as exploratory analysis for this stock. In addition, a yield-per-recruit (Y/R) analysis was carried out. The stock was also assessed by SURBA method. Both XSA and SURBA gave the same perception of the state of the stock.

PRECAUTIONARY REFERENCE POINTS: SGMED proposed the following reference points for sustainable exploitation related to high long term yield: $F_{0.1}$ (ages 0-4) ≤ 0.26 and $F_{max} = 0.46$

STOCK STATUS: After the minimum value observed in 2005 (c. 230 t) the SSB was constant in 2006 and 2007 and increased in 2008 to about 260t. Recruitment varied without any trend in the years 2005-2008, reaching a minimum in 2006. The value estimated in 2008 was similar to that of 2007. Exploitation decreased from 2005 to 2006, was constant in 2006-2007 and increased in 2008. The most recent estimate of fishing mortality (F_{0-4}) is F=1.35. With $F_{0.1}$=0.26 and F_{max} =0.46, the stock is considered being subject to overexploitation.

RECENT MANAGEMENT ADVICE: SGMED recommends the fishing effort to be reduced until fishing mortality is below or at the proposed level $F_{0.1}$. This should be achieved by means of a multi-annual management plan taking into account mixed-fisheries effects. Short- and medium-term predictions of catch and stock biomass consistent with a range of effort changes should be provided.

A reduction of *rapido* trawling fishing pressure would be especially recommended, taking into account that the catches of this gear are mainly based on juveniles. Recruitment success appears to be highly related to environmental conditions in the Adriatic and fishing effort by the Rapido trawl fishery compromises recruitment success particularly in years when environmental conditions are unfavourable. An additional two–months closure for *rapido* trawling inside 11km offshore along the Italian coast, after the biological fishing ban (August), would be also advisable to reduce the portion of 0-group sole in the catches.
For the same reason, specific studies on *rapido* trawl selectivity are necessary. In fact, there is some evidence that the adoption of a larger mesh size would not result in an increase in the selectivity of this gear for sole. The effect of square mesh on the selectivity on in the Adriatic for Rapido trawlers is unknown.

The main winter spawning area for sole extends from the easter coast to the centre of the Adriatic Sea. A closure of this area during the spawning season is likely to offer much needed protection of the existing spawning stock in order to allow the SSB to rebuild.

Finally, a set of specific management rules for *rapido* trawl fishery would be advisable (e.g.: size and number of gears, mesh size, towing speed).

STECF COMMENTS: STECF endorses the advice from SGMED and agrees with the advice provided by GFCM-SAC. STECF supports the recommendation that the impact of rapido trawlers on juvenile sole be taken into account in the development of the Italian management plan. Since the rapido trawlers prosecute a mixed fishery, other species -specific measures will also need to be considered.

STECF recommends that short and medium term projections be undertaken during the next SGMED meeting (SGMED 09-03) scheduled for December 2009.

7.44. Monkfish (*Lophius budegassa*) in Geographical Sub Area 6. Northern Spain

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: The monkfish *Lophius budegassa* is one of the two species of anglerfish captured as by-catch by the Mediterranean trawl fleets exploiting from the coast to the continental shelf edge. In spite of the fact that catches are scarce, this species is very important for its economic value. The small size individuals are usually included in the "mixed" commercial categories, so making difficult to collect data to obtain a realistic knowledge of the current exploitation level of this species.

SOURCE OF MANAGEMENT ADVICE: A preliminary stock assessment of monkfish was carried out in 2007 based on landings data (1996-2006) of trawl fishery on the Southwest of the Mediterranean Sea (GSA06, Santa Pola port). The assessment is an improvement of the previous one as data on mixed-species categories in landings were available. Natural mortality vector was estimated by PROBIOM Excel spreadsheet (Caddy and Abella, 1999).

PRECAUTIONARY REFERENCE POINTS: No reference points have been defined for this stock.

STOCK STATUS: The natural mortality is estimated to be slightly higher than the Fishing mortality. The highest fishing mortality is on the oldest age classes. The stock is considered to be fully exploited at a precautionary level.

RECENT MANAGEMENT ADVICE: The SAC-GFCM Sub-Committee on Stock Assessment (SCSA) made no specific comments regarding this preliminary stock assessment of monkfish (*Lophius budegassa*), but pointed out that these results must be considered with caution, because the data come from a year and one port, and the smaller individuals are still slightly underestimated.

STECF COMMENTS: STECF notes that in the absence of reference points the exploitation status of the stock cannot be fully evaluated and no advice can be provided.

7.45. Common Dentex (*Dentex dentex*) in Geographical Sub Areas 12, 13. Tunisian coasts.

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: *Dentex dentex* is exploited in the Tunisian coasts by artisanal gears, especially the long-lines and the trammel-nets. Two separate stocks are assessed according to regions: the Northern and the Eastern coasts.

SOURCE OF MANAGEMENT ADVICE: The latest assessments were conducted in 2007 on data collected in 2004.

PRECAUTIONARY REFERENCE POINTS: No reference points have been defined for this stock.

STOCK STATUS: In the North (GSA 12), the yield by recruit value is below the optimal level; the stock seems to be underexploited. The exploitation profile in the eastern region (GSA 13) is in optimal conditions.

RECENT MANAGEMENT ADVICE: The SAC-GFCM Sub-Committee on Stock Assessment (SCSA) recommended as a precautionary measure not to increase the fishing effort in both areas. In the future, a more detailed description of the fishery should be provided to facilitate the management advice.

STECF COMMENTS: STECF notes that in the absence of reference points the exploitation status of the stock cannot be fully evaluated and no advice can be provided.

7.46. Norway Lobster (*Nephrops norvegicus*) in GSA 05 - Balearic Island

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: This species is one of the target species of the bottom trawl fishery developed off Mallorca by a fleet of around 40 vessels, being captured on the upper slope, between 350 and 600 m depth, jointly with other bycatch species such as *Merluccius merluccius*, *Lepidorhombus* spp., *Micromesistius poutassou* and *Lophius* spp. Annual landings from 1986 to 2007 fluctuated between 3 and 20 t. In the years 2002-2007 the average annual catch was 9.4 tons (3.3 t of females and 6.1 t of males).

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this species in the Mediterranean Sea.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM. A preliminary assessment of this stock has been carried out by means of VPA and yield-per-recruit (Y/R).

STOCK STATUS: Although the species seems to be "moderately exploited" and it could have some limited potential for expansion in total production, as a precautionary measure it should be considered as fully exploited. The fishery is operating at or close to an optimal yield level, with no expected room for further expansion.

RECENT MANAGEMENT ADVICE: Although this is only a preliminary stock assessment, SAC-GFCM Sub-Committee on Stock Assessment (SCSA) advises to not increase the fishing effort and to enforce the replacement of 40-mm diamond mesh in the bottom trawl cod-end by 40-mm square mesh.

STECF COMMENTS: STECF notes that in the absence of reference points the exploitation status of the stock cannot be fully evaluated and no advice can be provided.

7.47. Norway lobster (*Nephrops norvegicus)* in Geographical Sub Area 9. Ligurian and northern Tyrrhenian

FISHERIES: *Nephrops norvegicus* is one of the most important commercial species in GSA 9. All landings are due to bottom trawl vessels exploiting slope muddy bottoms mainly between 300 and 500 m depth. About 100 vessels exploit the species in the area. In the last five years the total landings of Norway lobster of GSA 09 fluctuated between 248 (2005) to 228 tons (2008). The catch is mainly composed by adult individuals over the size-at-maturity. Discarding of specimens under MLS (20 mm CL) is negligible.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM. Since 2009, advice has also been provided by SGMED. Data coming from MEDITS (1994-2008) and GRUND (1994-2006) trawl surveys were used to estimate relative SSB and F with Surba. DCR data (size distribution of trawl landings 2006-2008) were used to estimate F at age and absolute abundance at age with VIT (LCA analysis).
PRECAUTIONARY REFERENCE POINTS: The reference points, $F_{0.1}$ and F_{max}, estimated for this species using the Yield software were 0.21 and 0.36 (median values), respectively.

STOCK STATUS:
SGMED-09-02 could not fully evaluate the state of the SSB due to the lack of precautionary management reference points. Relative spawning stock biomass (SSB) indices derived from trawl surveys showed a fluctuating trend. An increase in SSB occurred in recent years (2005-08). Recruitment (age groups 1+ and 2+) shows a significant increasing trend since 1994 (3-4 fold).

Recent values of F_{3-7} obtained from commercial data were: 0.32 (2006), 0.30 (2007), and 0.36 (2008). Similar F_{3-7} values were obtained from trawl survey data using Surba (0.36 in 2006 and 0.33 in 2007), indicating that the stock is currently fully exploited or lightly overexploited.

RECENT MANAGEMENT ADVICE: SGMED recommended to reduce specific effort until fishing mortality is below or at the proposed $F_{0.1}$ level (0.21). This should be achieved by means of a multi-annual management plan taking into account mixed-fisheries effects.

STECF COMMENTS: STECF endorses the SGMED advice. STECF recommends that short and medium term projections be undertaken during the next SGMED meeting (SGMED 09-03) scheduled for December 2009. STECF notes that no advice was provided by GFCM-SAC.

7.48. Blue and Red Shrimp (*Aristeus antennatus)* in Geographical Sub Area 5. Balearic Islands

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: The red shrimp is one of the most important resources for bottom trawling in the Balearic Islands. It is fished on the slope between 400 and 800 m depth. In biomass, it represents an average of 5% of the overall catches, but its economic value is 30% of the total earnings of the fishery. Updated information on landings and effort collected on annual basis (1992-2007) show that throughout the late 1990s, landings decreased to a minimum value of 100 t. During early 1990s and from 2000s they fluctuated between 200 and 250 t. Females dominate in the landings, nearly 70-80% of the total.

The present trawl fleet includes 46 vessels,about 50% of the fleet fish regularly on the slope. Total discards was estimated to 33% of reported landings in 2005 (DCR discards data assessment). Discards for the target species (red shrimp) are considered nul (below 0.001%).

The number of red shrimp vessels for the whole GSA 05 has been decreased steadily from the early 1990s.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM. A VPA based assessment was conducted using catch information, length frequency data for landings, information on fishing effort and survey data.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed.

STOCK STATUS: Recruitment has fluctuated without any trend since from 1992 to 2004. For the recent years (2004-2007) recruitment has shown a decreasing trend.

F has fluctuated between 0.8 and 0.3 from the whole time series, with a decreasing trend until 2004, after which it remained fairly stable around 0.4~0.5.

Total Biomass (TB) has fluctuated with peaks in the beginning of the time series, in the early 2000s and in 2005. The present average biomass represents 52% of the virgin biomass.

RECENT MANAGEMENT ADVICE: The SAC-GFCM Sub-Committee on Stock Assessment (SCSA) recommends not increasing fishing effort.

STECF COMMENTS: STECF notes that in the absence of reference points the exploitation status of the stock cannot be fully evaluated and no advice can be provided.

7.49. Blue and Red Shrimp (*Aristeus antennatus)* in Geographical Sub Area 6. Northern Spain

FISHERIES: The red shrimp is one of the most important resources of bottom trawling in GSA 6. It is fished on the slope between depths of 400 to 800 m and is targeted by a specific trawl fleet. In 2002-2008 landings fluctuated between 300 and 650 t, with an average of around 500 t. Females dominate in the landings, accounting for nearly 80% of the total. Discards of the red shrimp are null. Fishing effort was reduced from 20,000 days in 2002 to 9,000 in 2006, with an increase thereafter, reaching 23,000 days in 2008.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM. From 2009 advice is also provided by SGMED. The state of exploitation was assessed for the period 2002-2008 by means of a VPA, tuned with standardised CPUE from commercial fleet and abundance indices from trawl surveys. A yield-per-recruit (Y/R) analysis (VIT program) was also applied.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for blue and red shrimp in the Mediterranean.

STOCK STATUS: The average SSB was 637 t in the period 2002-2008. SSB declined rapidly from 2002 to 2004, when it reached the lowest value (384 t) observed in the overall period, corresponding to 25% of that observed in 2002. Thereafter, SSB increased until 2008, coming back to the same level recorded at the

beginning of the assessed time period. Recruits increased from 2003 to 2007, remaining at a high level in 2008. Mean fishing mortality varied without a clear trend between 0.8 and 1.3 from 2002 to 2008. The highest value was observed in the last year. Due to the lack of a management reference point SGMED-09-02 was unable to fully evaluate the state of the stock and its level of exploitation.

RECENT MANAGEMENT ADVICE: SGMED had no basis to provide specific management advice.

STECF COMMENTS: STECF highlighted the lack of target reference points which makes the provision of scientific advice difficult, and recommends that candidate reference points for SSB and F be evaluated during the SGMED 09-03 meeting. STECF recommends that short and medium term projections be undertaken during the next SGMED meeting (SGMED 09-03) scheduled for December 2009. STECF notes that no advice was provided by GFCM-SAC.

7.50. Red Shrimp (*Aristaeomorpha foliacea)* in Geographical Sub Area 11. Sardinian Sea

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: *Aristaeomorpha foliacea* is one of the most important species in the Geographical Sub Area 11. The number of vessels has increased from 1994 to 2004 and old, low tonnage wooden boats have been replaced by larger steel boats. For the entire GSA an increase of 85% in number of boats >70 t has occurred.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM. No formal assessment of this stock is available, however, information on stock status is available from national research programs (GRUND) and international trawl surveys (MEDITS), as well as Catch Assessment Surveys (CAMPBIOL)

PRECAUTIONARY REFERENCE POINTS: Precautionary reference points have not been proposed for this stock.

STOCK STATUS: The available information indicates an increasing trend in fishing mortality, however, it is not possible to evaluate if the fishery on the stock is sustainable.

RECENT MANAGEMENT ADVICE: GFCM-SCSA did not provide any advice for this stock.

STECF COMMENTS: STECF has no comments.

7.51. Deep water rose shrimp (*Parapenaeus longirostris)* in Geographical Sub Area 6. Northern Spain

FISHERIES: The deep-water rose shrimp (*Parapenaeus longirostris*) is one of the most important crustacean species for the trawl fisheries in the GFCM GSA 6. A sharp increase in landings was observed from 1998 up to 2000, followed by a decreasing trend in 2001-2008. In 2008 the annual landings of this species amounted 33 t in the whole area, which is the lowest value observed. Fishing effort decreased from 50,000 days in 2000 to 13,000 in 2006, increasing up to around 18,000-19,000 in the last two years.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM. From 2008 advice is also provided by SGMED. The state of exploitation was assessed for the period 2002-2008 by means of a VPA tuned with standardised CPUE from commercial fleet and abundance indices from trawl surveys.

PRECAUTIONARY REFERENCE POINTS: SGMED recommended that $F \leq 0.2$ be established as a management target and a proxy for F_{msy}. The biomass reference points proposed for the stock are: B_{lim} = 300 t and B_{pa} = 1,200 t.

STOCK STATUS: Since 2002 SSB declined rapidly and continuously to the lowest value observed in 2008 (111 t), which represents only 8% of that observed in 2002. The MEDITS survey abundance index showed a very high peak in 1999-2001. Prior to 1999, abundance levels were comparable to those recorded in 2002-2008. SGMED noted that the level of 111 t is much lower than the proposed biomass references values. Recruits (age 0 individuals) were estimated to have declined from 2002 to 2005 in the same pattern as SSB, remaining very

low in 2006-2007. However, in 2008 recruitment returned to the 2003 level. Fishing mortality over ages 2-5 showed a high variation with an average value of F=0.5. SGMED 09-02 considered the stock being subject to overfishing.

RECENT MANAGEMENT ADVICE: SGMED recommended that the fishing effort be reduced until fishing mortality is below or at the proposed F_{MSY} proxy level (F=0.2). This should be achieved by means of a multi-annual management plan taking into account mixed-fisheries effects. Short- and medium-term predictions of catch and stock biomass consistent with a range of effort changes should be provided.

STECF COMMENTS: STECF notes the poor status of the deep water rose shrimp in GSA 06 and endorse SGMED and agrees with GFCM-SAC recommendations. STECF recommends that short and medium term projections be undertaken during the next SGMED meeting (SGMED 09-03) scheduled for December 2009.

7.52. Deep water rose shrimp (*Parapenaeus longirostris)* in Geographical Sub Area 9. Ligurian and northern Tyrrhenian

FISHERIES: The deep water rose shrimp is one of the most important target species of bottom trawl fishery in GSA 9. The fishing grounds are located on muddy bottoms from 150 to 500 m depth.
Annual trawl landings increased from 160 t in 2002 up to 450 t in 2006, decreasing to 220 and 254 t in 2007 and 2008 respectively. Discard of *P. longirostris* is scarce, ranging from 0.3 to 1.2% of the total catch of the species, and occurs mainly on the fishing grounds located at depth less than 200 m, where juveniles are more abundant.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM. From 2008 advice is also provided by SGMED. The state of exploitation was assessed for the period 1994-2008 by means of SURBA and VIT analysis.

PRECAUTIONARY REFERENCE POINTS: SGMED proposed F≤0.7 as management reference point (basis $F_{0.1}$(0-3)).

STOCK STATUS: SGMED was unable to estimate the absolute stock size. Since 1998, SSB has been showing great fluctuations without a clear trend. Recent recruitment (2004-2006) is above the average for the time series of recruitment index (1994-2006) in the years 2004-2006. F_{1-3} was 0.5-0.6 in the period 2006-2008.

RECENT MANAGEMENT ADVICE: Basing on F estimates, SGMED considers the stock being harvested in a sustainable manner. However, SGMED recommends not to increase the fishing effort and highlights that any management measure should consider the mixed nature of the fisheries exploiting the pink shrimp stock.

STECF COMMENTS: STECF endorses the advice from SGMED 08-04. STECF recommends that short and medium term projections be undertaken during the next SGMED meeting (SGMED 09-03) scheduled for December 2009. STECF notes that there was no advice provided by GFCM-SAC.

7.53. Deep water rose shrimp (*Parapenaeus longirostris*) in Geographical Sub Area 15-16. Strait of Sicily

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: The deep-water rose shrimp is the main target species of the Sicilian trawlers and is caught both on shelf and upper slope throughout the year, peaking from March to July. The Sicilian trawlers between 12 and 24 LOA operate mainly on a short distance with trips from 1 to 2 days at sea, fishing on outer shelf and upper slope. The distant trawlers of Mazara del Vallo represent the main commercial trawling fleet of the area and one of the most important of the Mediterranean.

SOURCE OF MANAGEMENT ADVICE: The current fishing mortality was assessed with Length cohort analysis (LCA) on pseudocohort (2006-2007) and by Beverton & Holt Z estimator on trawl surveys data of MEDITS (2005-2005 and 2007) and GRUND (2005-2006) length frequency distributions. Yield and Biomass per Recruit and BRP (Fmax, $F_{0.1}$ and $F_{SPR0.3}$) were assessed with Y & B per R approaches.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points were proposed by GFCM-SAC for this stock.

Based on its evaluation of the STECF-SGMED, STECF proposes the following biological reference points for this stock.

$F_{0.1}$ (1-3)= 0.83	Females;(TRP)
F_{max} (1-3)= 1.27	Females; (LRP)
F_{msy} (age range)= not available	
F_{pa} (F_{lim}) (age range)= not available	
B_{msy} (spawning stock)= not available	

STOCK STATUS: Overexploited. The fishery is being exploited at above a level which is believed to be sustainable in the long term, with no potential room for further expansion and a high risk of stock depletion/collapse.

Fishing mortality is estimated to be lower than Fmax but above $F_{0.1}$. F = 0.87 is proposed as target reference point for this stock. Adopting F=1.27 as current F and F=0.87 as TRP, a decrease of 30% of the current fishing mortality is recommended.

RECENT MANAGEMENT ADVICE: SAC-GFCM Sub-Committee on Stock Assessment (SCSA) recommended to reduce the fishing mortality by 30% to the proposed target F of 0.87 by: a) decreasing of fishing capacity and activity; and b) improving the exploitation pattern (adoption of the new 40 mm square mesh opening and protect nurseries). SCSA also suggested to complete and improve the vessel monitoring system (VMS) to have data on spatial distribution of fishing effort.

In order to achieve the required reductions of fishing mortality, SGMED recommends reduction of fishing effort of the relevant fleet considering the mixed nature of the fisheries.

STECF COMMENTS: STECF endorses the advice of the SGMED 08-04 and agrees with the advice provided by GFCM-SAC.

7.54. Deep water rose Shrimp (*Parapenaeus longirostris)* in Geographical Sub Area 18. Southern Adriatic Sea

In the absence of any updates assessments, the summary and advice given below is reproduced from the STECF Review of advice for stocks of Community interest for 2009 (STECF, 2009, EUR 23630 EN).

FISHERIES: The deep water rose shrimp is one of the most important species in the Geographical Sub Area 18 representing more than 7-8% of landings from trawlers. Trawling represents the most important fishery activity in the southern Adriatic Sea with a yearly catch of around 30,000 t.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM. No formal assessment of this stock is available, however, information on stock status is available from national research programs (GRUND) and international trawl surveys (MEDITS), as well as Catch Assessment Surveys (CAMPBIOL)

PRECAUTIONARY REFERENCE POINTS: Precautionary reference points have not been proposed for this stock.

STOCK STATUS: Trend of abundance indices highlighted a sharp increase since 2000 in the basin and expansion of the range of its geographical occurrence in GSA 18, as indicated also by the GIS representations.

RECENT MANAGEMENT ADVICE: No recent management advice is available.

STECF COMMENTS: STECF notes that in the absence of reference points the exploitation status of the stock cannot be fully evaluated and no advice can be provided.

7.55. Giant red shrimp (Aristaeomorpha foliacea) in Geographical Sub Areas 15 and 16 – Strait of Sicily

FISHERIES: The giant red shrimps is a relevant target species of the Sicilian and Maltese trawlers. It is mainly caught on the slope ground in the central–eastern side of the Strait of Sicily all year round, but landing peaks occur in summer. In 2006-2008 the yield of the Italian trawlers ranged from 1,260 to 1540 t, with the lowset value in 2008. In the same period the catches of the Maltese trawlers were between 26 t in 2006 and 34 t in 2007. Females represented more than 60% of the landings in weight. Due to catch reduction, since 2004 some Sicilian trawlers have moved to the eastern Mediterranean (Aegean and Levant Seas) to fish red shrimps.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM. Since 2009 advice is also provided by SGMED. The state of exploitation was assessed by means of a VPA tuned with abundance indices from trawl surveys (2002-2008) and standardised CPUEs from the Sicilian commercial fleet (2006-2008). The SURBA software was also used to analyse the MEDITS time series.

PRECAUTIONARY REFERENCE POINTS: The management reference points proposed for the stock are: $F_{0.1}$ (1-3) = 0.35 and F_{max} (1-3) = 0.50

STOCK STATUS: The stock abundance estimated on the length structure of the Sicilian trawlers for the years 2006-2008 ranged between 1,721 t (2008) and 1,883 t (2006), the SSB representing about 75% of the total stock biomass. Data from trawl surveys combining the two GSAs indicated the stock to vary without any evident trend over the period 2002-2008, with the highest SSB value in 2008. Due to the lack of precautionary management references SGMED was unable to fully evaluate the state of SSB.
The recruitment (18-22 mm CL) estimated with VIT ranged between 63 (2008) and 95 (2007) millions of recruits. A low variability in recruitment indices derived from SURBA was observed when combining the data of the two GSAs from 2002 to 2007, with the exception of a sudden fall in recruit density observed in 2006 in both GSAs 15 and 16.
As recent F (F_{2008} = 0.77) was estimated to be significantly higher than both $F_{0.1}$ and F_{max}, SGMED concluded that the stock of giant red shrimp in the GSAs 15 and 16 is overexploited.

RECENT MANAGEMENT ADVICE: SGMED recommends the fishing effort to be reduced until fishing mortality is below or at the proposed $F_{0.1}$ level. This should be achieved by means of a multi-annual management plan.

STECF COMMENTS: STECF endorses the advice from SGMED 09-02. and recommends that candidate SSB reference points are evaluated during the SGMED-09-03. STECF recommends that short and medium term projections be undertaken during the next SGMED meeting (SGMED 09-03) scheduled for December 2009. STECF notes that there was no advice provided by GFCM-SAC.

8. Elasmobranch Resources in the Mediterranean Sea

A long list of elasmobranch species has been reported to occur in the Mediterranean with 71 different species reported to be taken by Mediterranean fisheries. According to the official statistics provided by FAO-GFCM capture fisheries production dataset (Fishstat, 1970-2007), the nominal landings of elasmobranches from the Mediterranean and Black Sea reached the highest values in the 1980s and 1990s, mainly reported in the Ionian Sea, with peaks of >23,000 tonnes in 1984, 1985, and 1994. From 1994, landings gradually declined, reaching a minimum of 8,732 tonnes in 2004. In the following years reported landings slightly increased. In 2007 the total nominal landing in the Mediterranean was 11,500 t.

According to IUCN (based on assessments conducted in 2003), forty-two percent (30 species) of Mediterranean chondrichthyan fishes are considered threatened (Critically Endangered, Endangered or Vulnerable) within the region. Of these, 18% (13 species) are Critically Endangered, 11% (8 species) are Endangered and 13% (9 species) are Vulnerable. A further 18% (13 species) of Mediterranean chondrichthyans are assessed as Near Threatened and 14% (10 species) are assessed as Least Concern. Little information is known about 26% (18 species), which have therefore been assessed as Data Deficient. A higher percentage of elasmobranches are clearly more seriously threatened inside the Mediterranean than they are globally.

A feature of concern is the large number of gaps in the time series for elasmobranch species for the Mediterranean and poor identification of species in the landings. For example, the collective groups “Shark, rays, skates etc” and “Rays, stingrays, mantas” accounted for 59% of the total landings in 2007. In the Mediterranean, the collection of stock related variables is requested by DCR only for *Raja clavata* and *Raja miraletus,* but even for these two species member states may not collect any data if their landings for species are less than 200 tonnes on average during the three previous years or represent less than 10% of total Community

landings (Commission Decision, 2008/949/EC, adopting a multi annual Community programme pursuant to Council Regulation (EC) No 199/2008 establishing a Community framework for the collection, management and use of data in the fisheries sector and support for scientific advice regarding the Common Fisheries Policy). Consequently it is quite difficult to define and assess the most important stocks. The following list of species has been defined as a starting point for a better future definition, also taking into account the issues raised by the ICCAT, GFCM and the STECF-SGRST. The text reported below provides a summary of the stock and fishery related information available to STECF from FAO-GFCM and ICCAT as well as from MEDITS and GRUND programs at the time of preparing the report. Only two assessments on two stocks (*Raja clavata* and *Raja asterias*) in one GSA (9) were recently presented at the GFCM Subcommittee on Stock Assessment in 2008.

STECF notes that several updates, mainly regarding the landings and the stock status, have been added to the present report for most of the species listed below. However, more detailed data both on landings and on stocks are needed in the future for providing management advice for these stocks. Stock related variables are not collected in the framework of the DCR for most of elasmobranches, which makes stock assessment difficult for most species.

8.1. Basking shark (*Cetorhinus maximus*)

FISHERIES: The Basking shark is a by-catch in several fisheries with a very low market interest. Basking shark was mostly taken as a by-catch by driftnets used for swordfish fishery (driftnets have been banned since January 1, 2002 for the EU fleets, and since 2004 in all the Mediterranean according to ICCAT and GFCM Recommendations). It is also caught by several other fishing gears in the Mediterranean, mostly by gill and trammel nets or occasionally in pelagic trawls. This species is not considered as a commercial species in several areas.

On the basis of the most recent data reported by the FAO-GFCM Capture Fisheries Production Dataset (Fishstat, 1970-2007), landings for this species are only reported by Spain. The yearly landings ranged from 2 to 6 tonnes in the period 1996-2007, with a peak of 10 t in 2004, and represented from 0.1% to 0.7% of the total catch of elasmobranches in the western Mediterranean.

Documented fisheries in several regions have usually been characterized by rapidly declining local populations as a result of short-term fisheries exploitation, followed by very slow or no recorded population recovery. There is likely potential for similar population declines to occur in the future from directed and by-catch fisheries, driven at least in part by the demand for fins in international trade. This species is considered extremely vulnerable to overfishing, perhaps more than most sharks, ascribed to its slow growth rate, lengthy maturation time, long gestation period, probably low fecundity and probable small size of existing population.

SOURCE OF MANAGEMENT ADVICE: The advisory body is SAC-GFCM.

PRECAUTIONARY REFERENCE POINTS: None.

STOCK STATUS: no data available.

RECENT MANAGEMENT ADVICE: The Mediterranean is considered as a separate management unit. The Basking shark is a protected species in the Mediterranean, according to the Barcelona Convention (Appendix 2), the Bonn Convention (Appendix 1) and the Bern Convention (Appendix 2), and is also listed in Appendix II of CITES. This species is listed as Vulnerable both in the Mediterranean (VU A2bd; assessed in 2003) and globally (VU A1ad+2d; assessed in 2000) in the IUCN Red List.

STECF COMMENTS: STECF recommends a better reporting of the Basking shark catches from all the fisheries involved, with the purpose to assess the possible impacts.

8.2. Thresher shark (*Alopias vulpinus*)

FISHERIES: This pelagic species is sometimes caught by several fishing gears, always as by-catch, but it is often retained on board and sold on the market for its good price. In the Northern Adriatic Sea, gillnets (often set for demersal species) also have a by-catch of pelagic species, with *Alopias vulpinus* taken during the summer. A number of specimens of this species may be also taken in large driftnet fisheries; even though this fishery has been prohibited in the Mediterranean for several years. Surface long-line fisheries, that target tuna and swordfish, also catch *A. vulpinus*.

Data on catches are extremely poor and sometimes include another species (*Alopias superciliosus*), much more rare in the Mediterranean. On the basis of the most recent data reported by FAO-GFCM Capture Fisheries Production Dataset (Fishstat, 1970-2007), landings for this species in the Mediterranean are reported by Spain (1997-2007), Portugal (2001-2007), and France (1999-2007). The catches ranged from 3 to 21 tonnes in the period 1996-2006, representing from 0.1% to 1% of the annual total catch of elasmobranches reported for the western Mediterranean. The annual mean catch was around 15 t between 1999 and 2006 but declined to 8 t in 2007.

SOURCE OF MANAGEMENT ADVICE: The advisory body is SAC-GFCM, but this species is also under the ICCAT responsibility.

PRECAUTIONARY REFERENCE POINTS: None

STOCK STATUS: The Mediterranean is considered as a separate management unit for this species. In the IUCN Red List, the species is listed as Vulnerable in the Mediterranean (VU A2bd + 3bd; assessed in 2003). The global population is listed as Data Deficient (DD; assessed in 2002) due to a lack of catch data, incomplete knowledge of stock structure, and uncertainty over life history parameters which make it impossible to determine population size and fluctuations.

RECENT MANAGEMENT ADVICE: None.

STECF COMMENTS: STECF recommends a better reporting of the Thresher shark catches from all the fisheries and Member States involved, with the purpose of better understanding the current state of the stock.

8.3. Tope shark (*Galeorhinus galeus*)

FISHERIES: This pelagic species is caught by a variety of fishing gears, always as by-catch, but it is often retained on board and sold on the market. A target fishery used to be practiced two decades ago in the central Aegean Sea, with steel-wired longlines. Specimens may be caught in large pelagic long-line fisheries and set nets fisheries. Data on catches are extremely scarce, often mixed with other species. On the basis of the most recent data reported in the FAO-GFCM Capture Fisheries Production Dataset (Fishstat, 1970-2007), landings for this species are only reported by Spain (2004-2007), ranging between 15 and 36 t, representing about 1% of the total catch of elasmobranches in the western Mediterranean.

SOURCE OF MANAGEMENT ADVICE: The advisory body is SAC-GFCM.

PRECAUTIONARY REFERENCE POINTS: None

STOCK STATUS: The Mediterranean is considered as a separate management unit for this species. Although there are no target fisheries for *G. galeus* in the Mediterranean, declines are suspected to have occurred, and by-catches are rare. Overfishing, together with habitat degradation caused by intensive bottom trawling, are considered some of the main factors that have produced the suspected decline of the Mediterranean stock. In the IUCN Red List, it is listed as Vulnerable both in the Mediterranean (VU A2bd; assessed in 2003) and globally (VU A2bd + 3d + 4bd; assessed in 2006).

RECENT MANAGEMENT ADVICE: None.

STECF COMMENTS: STECF recommends the collection of basic information on the tope shark catches to better understand the current situation of the stock.

8.4. Smooth hammerhead (*Sphyrna zygaena*)

FISHERIES: A relatively common and widespread shark, captured in a number of fisheries throughout its range, mostly by gillnet and long-line. There might be a significant mortality of this species in large-scale long-line and driftnet fisheries, even though this fishery is prohibited in the Mediterranean. However, the impact of these fisheries on populations is unknown at present. Data on catches are extremely scarce. On the basis of the most recent data reported in the FAO-GFCM Capture Fisheries Production Dataset (Fishstat, 1970-2007), landings for this species are only reported by Albania (2000-2006), ranging between 0 and 7 t, corresponding to around 0.3% of the total catch of elasmobranches in the central Mediterranean. Zero catches were reported in 2007. These catches are clearly underestimated due to the non-reporting by many Mediterranean States.

SOURCE OF MANAGEMENT ADVICE: The advisory body is SAC-GFCM, but this species is also under the ICCAT responsibility.

PRECAUTIONARY REFERENCE POINTS: None

STOCK STATUS: In the IUCN Red List, it is listed as Vulnerable in the Mediterranean (VU A4bd; assessed in 2003) and LR/nt (Lower Risk, near threatened; assessed in 2000) globally.

RECENT MANAGEMENT ADVICE: None.

STECF COMMENTS: STECF recommends the collection of basic information on the smooth hammerhead catches by the EU Member States to better understand the current situation of the stock.

8.5. *Carcharhinus* spp.

FISHERIES: In the Mediterranean waters the genus *Carcharhinus* is represented by 8 taxa (*C. altimus, C. brachyurus, C. brevipinna, C. falciformis, C. limbatus, C. obscurus, C. plumbeus,* and *Carcharhinus* spp.), many of which occur primarily in the western parts, close to the Gibraltar Strait (FAO statistical sub-area 1.1) and North African coasts. These species are often caught as by-catch in surface long-line fisheries targeting tuna and swordfish. A number of specimens may also be caught by large driftnet fisheries, even though this fishery is prohibited in the Mediterranean. In Libya they can sometimes be considered as target species. Management units are suggested for all species known to occur in the Mediterranean.

The landings of most of these species are usually included by FAO (Fishstat, 1979-2007) in the large group of sharks, rays, skates, etc., and they are not included in the ICCAT SCRS report.

SOURCE OF MANAGEMENT ADVICE: The advisory body for these species are SAC-GFCM and ICCAT.

PRECAUTIONARY REFERENCE POINTS: None

STOCK STATUS: Sandbar shark (*C. plumbeus*) is one of the most widely distributed members of this genus in the Mediterranean, and it has important nursery grounds in certain areas (e.g. in FAO sub-area 3.1). As a preliminary measure, three separate management units are proposed (FAO statistical areas 1, 2 and 3). In the IUCN Red List, it is listed as Endangered in the Mediterranean (EN A2bd + 4bd; assessed in 2003) and LR/nt (Lower Risk, near threatened; assessed in 2000) globally.

Spinner shark, *C. brevipinna,* and blacktip shark, *C. limbatus,* are both widely distributed throughout the Mediterranean, although they may be more common along the coasts of North Africa. The suggested management unit for these two species is the Mediterranean, where their status is Data Deficient (DD; assessed in 2003) according to the IUCN. Globally they are listed as LR/nt (Lower Risk, near threatened; assessed in 2000) in the IUCN Red List.

Bignose shark, *C. altimus,* copper shark, *C. brachyurus*, and dusky shark, *C. obscurus,* are all species occurring in the Northeast Atlantic and western Mediterranean, although occasional specimens are recorded from eastern Mediterranean basins. Each of these species should be managed for the Northeast Atlantic, including the Mediterranean. All three species are listed as Data Deficient (DD; assessed in 2003) in the Mediterranean according to IUCN. Globally, *C. brachyurus* and *C. obscurus* are listed as LR/nt (Lower Risk, near threatened; assessed in 2003 and 2000 respectively) in the IUCN Red List.

Silky shark *C. falciformis* is an oceanic species that is occasionally reported from the Mediterranean and off Spain. This species should be managed as a North Atlantic population, which includes the Mediterranean.

RECENT MANAGEMENT ADVICE: None.

STECF COMMENTS: STECF recommends the collection of basic information on the catches of the different *Carcharhinus* species occurring in the Mediterranean with the aim of better understanding the current state of these species and assessing the possible impacts of the different fisheries.

8.6. Sixgill shark (*Hexanchus griseus*)

FISHERIES: This large demersal species is occasionally caught by several fishing gears, as by-catch, and sometimes retained on board and sold on the market. Target fisheries (long lines or bottom gillnets) exist in some parts of the Mediterranean (e.g., in the Greek seas). Data on catches are extremely scarce. Studies conducted during the MEDITS project (1994-1999) assessed the standing stock biomass in the Mediterranean at about 440 tonnes. Deep commercial trawl surveys (1998-99) in the western Italian basins showed yields of

about 1.2 kg/hour in average, with a peak of 4.7 kg/h in the Tyrrhenian Sea. More recent catch data are not available.

SOURCE OF MANAGEMENT ADVICE: The advisory body is SAC-GFCM.

PRECAUTIONARY REFERENCE POINTS: None.

STOCK STATUS: Due to the little information available, the stock should be managed for the whole Mediterranean. It is listed as LR/nt (Lower Risk, near threatened) in the IUCN Red List both in the Mediterranean and globally (assessed in 2003 and 2000 respectively).

RECENT MANAGEMENT ADVICE: None.

STECF COMMENTS: STECF notes that no new catch data are available and recommends the collection of basic information on the sixgill shark catches, to better understand the current situation of this long-living species. The MEDITS time series (1994-2009) of catches is an important source of data and should be analyzed to find recent trends in the abundance and/or occurrence of the species.

8.7. Spurdog (*Squalus acanthias*)

FISHERIES: This demersal species is commonly caught by trawlers and often retained on board and sold on the market. Data on catches are good in some countries (e.g., Greece) and poor in others, according to the various statistical systems adopted. The species is easily confused with *Squalus blainvillei*, also present in the Mediterranean. On the basis of the most recent data reported in the FAO-GFCM Capture Fisheries Production Dataset (Fishstat, 1970-2007), landings of this species in the Mediterranean and Black Sea were reported by France, Malta, Slovenia, Spain, Bulgaria, Romania and Ukraine and ranged from 86 to 1789 tonnes in the period 1970-2007, representing from 0.6% to 7.8% of the total catches of elasmobranches reported in the Mediterranean and Black Sea. The catches peaked in 1988 at 1789 t and then gradually declined to levels around 100 t (86 t in 2007). Most of the catches were reported from the Black Sea. The minimum value of catches was observed in 2007.

Studies conducted during the MEDITS project (1994-1999) assessed the standing stock biomass in the Mediterranean at about 6,682 tonnes. Deep commercial trawl surveys (1998-1999) in the western Italian basins showed yields of about 0.14 kg/h in average, with a peak of 0.64 kg/h in the Sardinian Sea.

SOURCE OF MANAGEMENT ADVICE: The advisory body is SAC-GFCM.

PRECAUTIONARY REFERENCE POINTS: None.

STOCK STATUS: Although naturally abundant, this is one of the more vulnerable species of shark to over-exploitation by fisheries because of its late maturity, low reproductive capacity, longevity, long generation time (25-40 years) and, hence, a very low intrinsic rate of population increase (2-7% per year). Population segregation and an aggregating habit make mature (usually pregnant) females highly vulnerable to fisheries even when stocks are seriously depleted. In the MEDITS 2007 report, *Squalus acanthias* population exhibited no trend in abundance in 3 GSAs where it was evaluated. Mediterranean and Black Sea stocks are unmanaged, with a >60% decline reported in a Black Sea stock assessment for 1981-1992. For these reasons this species was listed as Endangered for the Mediterranean by the IUCN Red List (EN A2bd+4bd; assessed in 2003), while globally the species is listed as Vulnerable (A2bd + 3bd + 4bd; assessed in 2006).

RECENT MANAGEMENT ADVICE: The information available indicates that it may be appropriate to establish separate management areas for fisheries exploiting spurdog in the Mediterranean and Black Sea.

STECF COMMENTS: STECF recommends the collection of data on catches and fisheries separately by management area. The MEDITS time series (1994-2009) of catches is an important source of data and should be analyzed to find recent trends in the abundance and/or occurrence of the species.

8.8. Small-spotted catshark (*Scyliorhinus canicula*)

FISHERIES: The presence of *S. canicula* in the Mediterranean Sea is mainly linked to the continental shelf with the highest densities between 50 and 200 m. The main concentration areas of the juveniles (total length <28 cm, weight <68 g) are located at greater depths, essentially between 200 and 500 m (Corsica and Sardinia), with the exception of the western Morocco (100-200 m depth). The small-spotted catshark *Scyliorhinus canicula* is common over all the shelf of the northern Mediterranean Sea excluding the southern portion of Italy where it is

less abundant. Trawlers and set gillnets very commonly catch this demersal species which is often retained on board and sold on the market. Data on catches are good in some countries (i.e.: Greece) and poor in others, according to the various statistical systems adopted. Although it is widespread over the Mediterranean, landings for this species are reported only by France (Fishstat, 1970-2007) and they amounted to around 30 tonnes/year in the period 2000-2007 (29 t in 2007), representing from 1.2% to 2.3% of the total catches of elasmobranches reported in the western Mediterranean basin.

Studies conducted during the MEDITS project (1994-1999) showed a high frequency of occurrence (>5% of the hauls) and abundance (>10 kg/km^2 or >10% of relative biomass) for this species. MEDITS project assessed the standing stock biomass in the Mediterranean at about 8,396 tonnes, the highest value among all the elasmobranch species. The highest densities (>100 kg/km^2) were located around Corsica and Sardinia Islands, but significant densities (30-50 kg/km^2) were also found in the Gulf of Lion, Catalan and Aegean Seas. The most representative biomass of small-spotted catshark in the Mediterranean (about 2,900 tons) was located on the Greek shelf in the Aegean Sea, likely due both to the large extension of the continental shelf and to under-exploitation. In the western part of the Mediterranean, from France to Morocco, *S. canicula* showed a latitudinal distribution pattern, with both density and biomass dominating in the Catalan Sea and decreasing towards lower latitudes (Morocco).

SOURCE OF MANAGEMENT ADVICE: The advisory body is SAC-GFCM.

PRECAUTIONARY REFERENCE POINTS: None.

STOCK STATUS: In the MEDITS 2007 report, *Scyliorhinus canicula* population showed no trend in abundance in 9 GSAs, increasing trend in 2 areas (Northern Alboran Sea, South Sicily and Malta), and decreasing trend in one GSA (Gulf of Lions). Indications at the present time are that the status of this species in the Mediterranean and globally is Least Concern (LC, proposed for the IUCN Red List).

RECENT MANAGEMENT ADVICE: The information available indicates that it may be appropriate to establish separate management areas for fisheries exploiting *S. canicula* in the Mediterranean and Black Sea.

STECF COMMENTS: STECF notes the lack of recent assessment for this species and recommends the collection of data on catches and basic biological data to better define the stock status and the local populations. The MEDITS time series (1994-2009) of catches is an important source of data and should be analyzed to find recent trends in the abundance and/or occurrence of the species.

8.9. Blackmouth catshark (*Galeus melastomus*)

FISHERIES: Common to abundant where it occurs, from upper continental slope between 200 and 1200 m of depth, mainly at 300 to 400 m in all the Mediterranean basin (excluding north Adriatic sea and the Black sea). Blackmouth catshark is often caught as by-catch by trawl nets and bottom long-lines and has not a good commercial value with most captured specimens discarded at sea, especially in the Italian seas.

On the basis of the most recent data reported in the FAO-GFCM Capture Fisheries Production Dataset (Fishstat, 1970-2007), landings for this species are only reported by Spain. The yearly landings ranged from 49 to 90 tonnes in the period 2002-2007, with an average value at around 60 tonnes/year, and represented from 2% to 6% of the total catches of elasmobranches in the western Mediterranean.

The species showed a high occurrence and abundance (>5% of the hauls and >10 kg/km^2 or >10% of relative biomass) throughout the surveyed areas. Particularly high abundances were found in the Alboran Sea, central Tyrrhenian, south Adriatic Sea and the Sicilian Channel, with locally very high concentrations up to 480 kg/km^2. The standing stock biomass in the Mediterranean was assessed at about 6,891 tonnes, one of the highest values among all the elasmobranch species. Deep commercial trawl surveys (1998-99) in the western Italian basins showed yields around 1.3 kg/hour in average, with a peak of 2.7 kg/h in the central Tyrrhenian Sea. Along Morocco, Spain, France and around Crete Island the specimens larger than 30 cm of total length were dominating (78% of the total). The opposite happened around Corsica and Sicily islands, in the Ionian, and south Adriatic and Aegean Seas, where the specimens over 30 cm TL only represented the 23% of the total sampled population. An intermediate situation was observed in the Tyrrhenian Sea, where 44% of the sampled population was below 30 cm TL.

SOURCE OF MANAGEMENT ADVICE: The advisory body is SAC-GFCM.

PRECAUTIONARY REFERENCE POINTS: None.

STOCK STATUS: The time series (1994-2004) of the abundance indicator of blackmouth catshark had an increasing trend in 4 MEDITS GSAs (Northern Spain, Corsica, Ligurian and North Tyrrhenian Sea, South and Central Tyrrhenian) and was stable in 8 GSAs, while the average length was stationary in all areas. In the Mediterranean, this species is of Least Concern (LC, proposed for the IUCN Red List). No decline in abundance was observed in any MEDITS GSA during 1994-2004.

RECENT MANAGEMENT ADVICE: None.

STECF COMMENTS: STECF notes the lack of recent assessment and recommends a better reporting of the blackmouth catshark catches from all the fisheries and Member States involved to better understanding the current state of the stock. The MEDITS time series (1994-2009) of catches is an important source of data and should be analyzed to find recent trends in the abundance and/or occurrence of the species.

8.10. Blue stingray (*Pteroplatytrygon violacea*)

FISHERIES: This species is very commonly caught by pelagic gears as by-catch and more rarely by trawlers; it is sometimes retained on board and sold in a few markets. Data on catches are usually extremely poor. This species represented 9.3% in weight of the total catches obtained by swordfish long-lines in 1991 in the Tyrrhenian Sea. A number of specimens may be taken also in large driftnet fisheries, although this fishery is prohibited since years in the Mediterranean. During twenty-two GRUND trawl surveys carried out from 1985 to 1998 in the Italian waters the percentage presence of *P. violacea* was low (6.20%).

SOURCE OF MANAGEMENT ADVICE: The advisory body is SAC-GFCM.

PRECAUTIONARY REFERENCE POINTS: None.

STOCK STATUS: There are no reliable quantitative estimates of stock status. In the Mediterranean, this species is listed as LR/nt (Lower Risk, near threatened; assessed in 2003) according to the IUCN Red List.

RECENT MANAGEMENT ADVICE: None.

STECF COMMENTS: STECF notes the lack of recent data and recommends a better reporting of the Blue stingray catches from all the fisheries and Member States involved due to the high number of specimens reported in surface fisheries.

8.11. Skates (*Rayformes*)

FISHERIES: Fifteen species of skate occur in the Mediterranean Sea (*Dipturus batis, D. oxyrhynchus, Leucoraja circularis, L. fullonica, L. melitensis, L. naevus, Raja asterias, R. brachyura, R. clavata, R. miraletus, R. montagui, R. polystigma, R. radula, R. undulata* and *Rostroraja alba*), including several species of Atlantic skate that are distributed in the western Mediterranean only, with fewer species occurring in the eastern Mediterranean. As in Atlantic regions, the genus *Raja* dominates in coastal waters, with *Leucoraja* spp. and *Dipturus* spp. abundant further offshore. For example, Italian fisheries operating in deep-waters (350-800 m) take *D. batis, D. oxyrinchus,* and *L. circularis*. There are two endemic skates present: the Maltese ray (*Leucoraja melitensis*) and speckled ray (*Raja polystigma*). All the species are very commonly taken by trawlers and by artisanal coastal fisheries; some of them are retained on board and sold on the market. Data on catches are usually extremely poor and mixed. In FAO statistics all rays, stingrays and mantas are grouped in one category. Total landings for this category in the Mediterranean ranged from 3,160 to 9,418 tonnes during the period 1970-2007. Good catch rates of *R. clavata* are found in the Gulf of Lions, Corsica, Sardinia and Greece waters. It is worth noting that up to 64% of the total Mediterranean chondrichthyans biomass is located in the Aegean Sea, where trawling deeper than 400 m is practically inexistent. Considering the mean size at first maturity of this species calculated for all the Mediterranean area, the Ionian Sea is the most important area where the juvenile specimens are concentrated.

SOURCE OF MANAGEMENT ADVICE: The advisory body is SAC-GFCM.

PRECAUTIONARY REFERENCE POINTS: None.

STOCK STATUS: Studies conducted during the MEDITS project (1994-1999) based on trawl surveys assess the mean standing stock biomass in the Mediterranean of all these species at 16,744 tonnes in total. The most common species is *Raja clavata*, having a standing stock biomass of 8,151 tonnes. In the MEDITS 2007 report which covers the period 1994-2004, *Raja asterias* population exhibited no trend in abundance in 4 subareas,

increasing trend in 1 subarea (Corsica) and decreasing trend in 1 subarea (Aegean Sea). *R. clavata* population exhibited no trend in abundance in 6 subareas, increasing trend in 1 subarea (South of Sicily and Malta) and decreasing trend in 1 subarea (Corsica). These species were separately assessed in GSA 9.

The common skate, *Dipturus batis,* formerly occupied the shelf and slope areas of the Mediterranean excluding North Africa, west of Morocco, but now appears to be virtually absent from much of this range. It is reported as locally extinct in the Adriatic Sea. It is also presumed absent from Tunisian waters where it has not been recorded since 1971. *Dipturus batis* is listed as Critically Endangered (CR A2bcd + 4bcd) both in the Mediterranean and globally (assessed in 2003 and 2006 respectively).
The Maltese skate *Leucoraja melitensis* is a Mediterranean endemic that is under imminent threat of extinction. It was previously found over a relatively restricted area (about ¼ of the total area of the Mediterranean Sea) in the depth range where trawl fisheries routinely operate. This species is now extremely rare and its main range now appears to be restricted to the Strait of Sicily. It is also rare off Malta and rare or absent off Tunisia, where it was previously considered moderately common. Although population data are lacking, given the small range of the remaining population, the potential detrimental impact of trawl fisheries is likely to be significant. The Maltese skate, *Leucoraja melitensis,* is assessed as Critically Endangered (CR A2bcd + 3bcd + 4bcd; assessed in 2006) on the basis of very rapid population decline, which is estimated to exceed 80% in three generations.

In the Mediterranean, the majority of the population of *Raja montagui* appears to exist between 100–500m, although it occurs from the shallows to 600m. Populations of *R. montagui* appear to be stable in most parts of the Mediterranean. *Raja montagui* has been assessed by IUCN as Least Concern in the Mediterranean (assessed in 2007), although population trends and by-catch levels should be monitored to ensure a stable population is maintained.

The white skate, *Rostroraja alba,* was formerly captured frequently in the NW Mediterranean during the 1960s and off Tunisian and Morocco in the early to mid 1970s. It is now considered rare and is believed to have undergone a significant but currently unquantifiable decline in abundance and extent. The MEDITS survey suggests a substantial reduction in geographic range and the current distribution of occurrence of this species represents a small fraction of its former range. *Rostroraja alba* is listed as Critically Endangered (CR A2cd + 4cd; assessed in 2003) in the Mediterranean and Endangered (EN A2cd + 4cd; assessed in 2006) globally.

The sandy skate, *Leucoraja circularis*, is listed as Endangered (EN A2bcd + 3bcd +4bcd; assessed in 2003) in the Mediterranean. The speckled skate, *Raja polystigma*, is considered endemic in the Mediterranean Sea. In the Mediterranean, this species is listed as LR/nt (Lower Risk, near threatened; assessed in 2003) according to the IUCN Red List. The sharpnose skate, *Dipturus oxyrhynchus* and the cuckoo skate *Leucoraja naevus,* are considered as LR/nt (Lower Risk, near threatened; assessed in 2003) according to the IUCN Red List. The twineye skate, *Raja miraletus,* is currently assessed as Least Concerned (LC; assessed in 2003) in the Mediterranean, while the shagreen skate, *Leucoraja fullonica,* the blonde skate, *Raja brachyura,* the rough skate, *Raja radula* and the undulate skate, *Raja undulata*, are all Data Deficient (DD; assessed in 2003) species in the Mediterranean.

RECENT MANAGEMENT ADVICE: None

STECF COMMENTS: STECF recommends the collection and reporting of basic data on species-specific catches. Research efforts focusing on species for which there is currently little knowledge (DD species) is highly desirable. Reporting in National and FAO statistics should be species specific. Protection measures of coastal and offshore nurseries areas of these species should be enforced. The MEDITS time series (1994-2009) of catches is an important source of data and should be analyzed to find recent trends in the abundance and/or occurrence of skates in the Mediterranean.

8.12. Thornback skate (*Raja clavata*) in Geographic Sub Area 9. Ligurian and Northern Tyrrhenian

FISHERIES: The assessment was based on the fishery activity in Viareggio (Northern Tyrrhenian Sea), where a fleet of 80 vessels of different sizes and tonnage is based. Most of them target demersal resources and in general utilize bottom trawl nets locally called “volantina”. A reduced number of vessels utilizing the *rapido* (a variant of the beam trawl) and part of the small-scale fleet also targets demersal species, but landings of these fractions of the fleet are of modest entity. Although commercial valued resources are distributed over all the

wide continental shelf and slope, considering the characteristics of the fishing vessels and traditions, the Viareggio fleet mainly exploit the coastal resources. The thornback skate is among the abundant species in catches.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM. A Y/R analysis, based on bottom trawl data obtained from a sampled fleet in the harbour of Viareggio in the years 1990-2004, was undertaken in 2008.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: The preliminary Y/R assessment provided the following results:

F = 0.25

Current Y/R: 0.257 kg per recruit

Maximum Y/R: 0.39 kg per recruit

Y/R 0.1: 0.38 kg per recruit

Fmax: 0.092

F0.1: 0.064

Maximum B/R: 13.68 kg per recruit

B/R: 1.03 kg per recruit

This population was defined as overexploited; however it is likely that the biological characteristics of the species made it more resilient to high levels of fishing activity. Research survey data do not show a decline in the abundance of *R. clavata* that can be interpreted as an index of recruitment overfishing. In fact, an increase in catch rates for this species is observed. These findings do not seem to be in agreement with those derived from commercial data, which suggest a negative trend for the species. The thornback skate, *Raja clavata,* in the Mediterranean and globally, is listed as LR/nt (Lower Risk, near threatened) according to the IUCN Red List.

RECENT MANAGEMENT ADVICE: The assessment is considered preliminary and no specific management advice has been recommended by the GFCM-SCSA.

STECF COMMENTS: STECF notes that the assessment has been performed on data collected by vessels from only one port of the GSA 9, and these results may not be representative of the overall state of the stock in GSA 9. A more extended database is necessary to provide the assessment for the entire GSA.

8.13. Starry skate (*Raja asterias*) in Geographic Sub Area 9. Ligurian and Northern Tyrrhenian

FISHERIES: The assessment was based on the fishery activity in Viareggio (Northern Tyrrhenian Sea), where a fleet of 80 vessels of different sizes and tonnage is based. Most of them target demersal resources and in general utilize bottom trawl nets locally called "volantina". A reduced number of vessels utilizing the *rapido* (a variant of the beam trawl) and part of the small-scale fleet also targets demersal species, but landings of these fractions of the fleet are of modest entity. Although commercial valued resources are distributed over all the wide continental shelf and slope, considering the characteristics of the fishing vessels and traditions, the Viareggio fleet mainly exploit the coastal resources. The thornback skate is among the abundant species in catches For *Raja asterias*, a nursery ground in the Tyrrhenian Sea was reported.

SOURCE OF MANAGEMENT ADVICE: The management advisory body is SAC-GFCM. A Y/R analysis based on bottom trawl data obtained from a sampled fleet in the harbour of Viareggio in the years 1990-2004 was undertaken in 2008.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: The preliminary assessment provided the following results:

F = 0.15
Current Y/R: 0.079 kg per recruit

Maximum Y/R: 0.097 kg per recruit
Y/R 0.1: 0.93 kg per recruit
Fmax: 0.33
F0.1: 0.23
Maximum B/R: 1.145 kg per recruit
B/R 0.1: 0.44 kg per recruit
The stock was preliminary assessed as moderately exploited, with a low level of fishing effort. The time series of LPUE shows no trend. Following the general criteria based on life history aspects to define extinction risk in marine fishes, *R. asterias* should be included within the "medium productivity category". This species is currently assessed as Least Concerned (LC) by the IUCN Red List, but further information on its status in the southern Mediterranean is needed.

RECENT MANAGEMENT ADVICE: The assessment is considered preliminary and no specific management advice has been recommended by the GFCM-SCSA.

STECF COMMENTS: STECF notes that the assessment has been performed on data collected by vessels from only one port of the GSA 9, and these results may not be representative of the overall state of the stock in GSA 9. A more extended database is necessary to provide the assessment for the entire GSA.

9. Resources in the Black Sea

9.1. Turbot (*Psetta maximus*) in Black Sea

FISHERIES: Turbot in the Black Sea is exploited by all riparian countries. In the last 5 years according to the official statistics the annual catch was between 400 and 1000t, 70% of which was caught by Turkish vessels. In EU waters (Bulgaria and Romania) the annual catch in 2007 and 2008 is about 100t corresponding to the agreed quota. The extent of illegal and unreported fishing in different countries is unknown, but is though to be important because of the high market value of turbot. Turbot fishing in Turkish waters of the Black Sea is carried out by bottom gill nets (70%), bottom trawls (28%) and by-catch from trawls and purse seines (2%). Turbot fishing in the other countries (including EU waters) is carried out by bottom gill nets because of a moratorium on bottom trawling.

Catches in the last years are in the order of 7% to 15% (depending on the countries) of the catches reported in the 1970s and 1980s.

SOURCE OF MANAGEMENT ADVICE: The management advice is provided by STECF based on assessments performed by the Black Sea Sub Group (STECF SG Black Sea-09-02). SG Black Sea has applied XSA to assess the stock of turbot, but because of uncertainties about actual catch the assessment is interpreted only in relative terms – i.e. it is considered indicative of trends only.

MANAGEMENT AGREEMENT: The TACs for turbot catches in 2007 and 2008 and quotas allocation was introduced regarding to Council Regulations (EC) No 1579/2007 and No 1139/2008. Both for Bulgaria and Romania quotas of 50 t for each country were permitted. The size of TAC is not based on an analytical procedure but on historical catches and is a matter of negotiations between Bulgaria, Romania and the EC. No management agreement exists with other Black Sea countries. Also mesh size of gillnets is regulated.

PRECAUTIONARY REFERENCE POINTS: Currently precautionary reference points are not applied.

STOCK STATUS: SG Black Sea has applied XSA to assess the stock of turbot, but because of uncertainties about actual catch the assessment is interpreted only in relative terms – i.e. it is considered indicative of trends only. Current biomass of turbot is much lower compared to historical levels. The drop in abundance is consistent with the decreases in CPUE and landings. Recruitment has increased since 2002 and positively influenced the SSB, but given that many small and immature turbot are caught by the fisheries such a positive influence may not propagate in the next years. Fishing mortality of turbot is high.

MANAGEMENT OBJECTIVES: No formal management objectives have been adopted either by the EU or other countries that exploit turbot in the Black Sea.

RECENT MANAGEMENT ADVICE: STECF consider that the results of the most recent assessment conducted during the STECF-SGRST Working Group in Brest in July 2009 are not sufficiently reliable to use as the basis for quantitative management advice on fishing opportunities for 2010. Therefore, in line with the advice given in STECF plenary report of April 2009, STECF advises that the exploitation of turbot in the Black Sea should be kept at the lowest possible level in order to allow the stock to recover.

STECF COMMENTS: The most recent assessment was rejected by STECF as a basis for advice on fishing opportunities for 2010 because of unreliable catch data and poor model fit.

FISHING OPPORTUNITIES FOR 2010 ACCORDING TO ANNEX II OF COM (2009) 224
With the background of the latest scientific assessments and advice and with reference to the Communication from the Commission (COM (2009) 224) on a consultation on fishing opportunities for 2010, STECF notes that this stock can be classified under Category 10. Accordingly STECF notes that the rules for the above category imply the following options for TACs in 2010.

Category 10 STECF advises a reduction to the lowest possible level or similar advice.

	2010 TAC *	Basis
Category 10	75t	The TAC should be reduced by at least 25%. Recovery measures should be implemented including effort reductions and introduction of more selective fishing gear

*** relates to a unilateral EU TAC**

9.2. Sprat (*Sprattus sprattus*) in Black Sea

FISHERIES: The fishing grounds of Black Sea sprat are in the shelf area (up to 100-120m in depth). Sprat fishing with mid-water trawls in EU waters and pair-trawls in Ukraine and in Turkey is undertaken with large fishing vessels (>12m) at mainly at depths between 30 and 60 m. During summer months (July-August) sprat inhabits deeper water below the thermocline (usually under 10.5 C at 20 m depth),. There is substantial warming up of waters during summer and above the thermocline water temperatures reach 25-27 C°. The sprat fishery is carried out year round, with the highest yields in May-October. In Turkey, the main fishing season is spring (April) and late autumn (November).

SOURCE OF MANAGEMENT ADVICE: The management advice is provided by STECF based on assessments performed by the Black Sea Sub Group (STECF SG Black Sea-09-02). Ukraine and Russian Federation also apply TAC in their national waters.

MANAGEMENT AGREEMENT: A quota is allocated in EU waters of the Black Sea (Bulgaria and Romania). No fishery management agreement exists between other Black Sea countries. In the EU Black Sea waters a TAC 12 750 t was set for 2009. This figure is a result of a reduction of the 2008 TAC of 15 000 t based on the precautionary principle.

PRECAUTIONARY REFERENCE POINTS: F_{MAX} could not be estimated. The YpR curve has a maximum well outside any reasonable range. The skewed shape of the YpR curve results from the high natural mortality and the short life span of sprat in the Black Sea. Due to such effects, STECF rejected the proposed $F_{0.1}$=1.71 as an appropriate management reference point.

The results of an age structured production model indicate that MSY is estimated to be in the range of 44,442 t. F_{msy} (ages 1-3) is estimated to be 0.53. B_{msy} appears to be in the range of 128,000 t.

STOCK STATUS: The analyse of the main population parameters reveals that the sprat stock has recovered from the depression in the 1990s due to good recruitment in 1999-2001 and the biomass and catches have gradually increased over the 1990s and early 2000s. The stock estimates, however, confirm the cyclic nature the sprat population dynamics. The years with relatively strong recruitment were followed by years of low to medium recruitment, which leads to a relative decrease of the Spawning Stock Biomass (SSB). High fishing mortalities (F_{1-3}) were observed in 1990-1994, 1998, and 2003. In recent years SSB has decreased due to lower recruitment and high fishing mortality. Landings have initially (in 2001-2005) reached levels comparable to the 1980s but then dropped in 2006-2007. In 2008 landings and fishing mortality increased again coincident with an expansion in the Turkish fishery. SSB and recruitment were at a medium level in 2008 similar to 2007. Short-

term projectons with status quo fishing of around 50,000t annual catch predict that in 2008-2011 SSB will decrease from 173,000 to 144,000 t (17%). Current fishing mortality F_{1-3} = 0.52 is close to the estimated F_{msy}=0.53.

MANAGEMENT OBJECTIVES: No formal management objectives have been adopted either by the EU or other countries that exploit sprat in the Black Sea.

RECENT MANAGEMENT ADVICE: STECF consider that the results of the most recent assessment conducted during the STECF-SGRST Working Group in Brest in July 2009 are not sufficiently reliable to use as the basis for quantitative management advice on fishing opportunities for 2010. In the absence of an allocation key for the international sprat catches, STECF is unable to advice on a specific EU TAC for sprat in the Black Sea. However, and in line with the advice given in STECF plenary report in 2009, STECF consider that the state of the stock in not known exactly but that the stock biomass is low compare to historical level.

STECF COMMENTS: The most recent assessment was rejected by STECF as a basis for advice on fishing opportunities for 2010 because of unreliable catch data and poor model fit.

FISHING OPPORTUNITIES FOR 2010 ACCORDING TO ANNEX II OF COM (2009) 224

With the background of the latest scientific assessments and advice and with reference to the Communication from the Commission (COM (2009) 224) on a consultation on fishing opportunities for 2010, STECF notes that Sprat in the Black Sea can be classified under Category 6.

Accordingly STECF notes that the rules for the above categories imply the following option for TAC in 2010.

	2010 TAC	Basis
Category 6	NE*	No EU-TAC set for this stock.

*** NE- not estimable**

10. Highly migratory fish (Atlantic and Mediterranean)

ICCAT is the RFMO directly responsible for the management of tuna and tuna-like species in the Atlantic Ocean, the Mediterranean Sea and the Black Sea. Along with these species, ICCAT is also responsible for all the other species taken as a by-catch in the tuna fisheries. This is the reason why this section includes not only the tuna and tuna-like species, but also the pelagic elasmobranch species that have been considered by the ICCAT-SCRS report in 2009.

The ICCAT Convention states that the stocks should be managed at MSY. F_{MSY} is thus probably the most appropriate fishing mortality-based target reference point, whereas the corresponding B_{MSY} is only appropriate as a target in an average or equilibrium sense. For this reason ICCAT, like most of the tuna commissions, have not defined any precautionary reference points for these stocks.

10.1. Bluefin (*Thunnus thynnus*), Eastern Atlantic and Mediterranean

FISHERIES: East Atlantic bluefin tuna is under a quota regime since 1998. Declared catches in the East Atlantic and Mediterranean reached a peak of over 50,000 t in 1996 and then decreased substantially after the adoption of TAC. In 2006 and 2007, declared catches were about 30,647 and 34,514 t (in total for the East Atlantic and Mediterranean together) respectively. Preliminary and incomplete catch data for 2008 report a total of 23,868 t. Available information, however, indicates that landings have been seriously under-reported and the Standing Committee on Research and Statistics (SCRS) of ICCAT has estimated the total catch in 2006 and 2007 at about 50,000 t and 61,000 t, taking into account the fishing capacity. Estimates of catch entered into the Mediterranean cages were about 16,000 t in 2008, which appears to be consistent with the estimates of 2008 purse seine catch.

Available indicators from fisheries exploiting juvenile bluefin in the Bay of Biscay since the mid 1970s do not show any clear trends. This result is not particularly surprising because of strong inter-annual variation in year class strength. ICCAT-SCRS reports that qualitative information from eastern Atlantic fisheries since 2007, together with the preliminary results of aerial surveys in 2009 give consistent indications of higher abundance or

higher concentration of small bluefin tuna in the north-western Mediterranean. This could reflect a positive outcome from the recent increase the minimum legal size, implemented under ICCAT Rec. 06-05 and/or recent recruitment success. Catch rate indicators from longliners and traps targeting large fish (spawners) in the Eastern Atlantic and the Mediterranean Sea also displayed a recent increase in cpue after a general decline since the mid-1970s

Bluefin tuna fisheries have been very active in the Mediterranean Sea and in the Black Sea since ancient times. The latest reported catches of bluefin tuna from the Black Sea are from the beginning of 1960's, but a few specimens were reported to have been caught there again in 2007, after more than 40 years of absence. The eastern bluefin stock is taken by a variety of vessels and types of fishing gears, with many landing sites located in many countries. The main gears are longline, trap and baitboat for the east Atlantic, and purse-seine, longline and traps for the Mediterranean. For EU Member States, driftnet fishing for tuna has been banned since January 1st 2002, while the ban entered into force in 2004 for all the other Contracting Parties to ICCAT, as well as the GFCM Member States, but a driftnet fishing activity is still officially permitted in Morocco. Recreational fishing may also be a relevant but unquantifiable source of fishing mortality on juvenile bluefin.

The rapid development of tuna farming in the Mediterranean Sea has induced further pressure on this stock and compounds the serious and well known problem of obtaining accurate catch data. Length compositions of the catches is affected by under-reported or over-quota components. Data on juvenile bluefin catches from the Mediterranean have not been available for many years, even though many fisheries targeting the first three age-groups occur in many areas. The lack of reliable data on juvenile catches has also compromised the ICCAT-SCRS assessments and advice for many years.

SOURCE OF MANAGEMENT ADVICE: The advisory body is ICCAT.

PRECAUTIONARY REFERENCE POINTS: STECF notes that precautionary reference points have not been proposed for this stock and that biological reference points derived from the assessment are poorly defined. F_{max} = 15,000 t or less, $F_{0.1}$ = 8,500 t or less. Long term yield approximated as the average of long term yield at F max or F0.1 over a broad range of scenarios = 50,000 t.

STOCK STATUS: ICCAT-SCRS stated in all its reports during the past 10 years that bluefin tuna data were unreliable and in 2009 indicted that without a significant and sustained effort at improved data, it is unlikely that the ICCAT-SCRS could improve, in the near future, its scientific diagnosis and management advice. Nevertheless, the ICCAT-SCRS assessed the stock in 2008, as requested by the ICCAT, on the basis of 2007 data. The 2008 assessment results indicate that spawning stock biomass has been declining rapidly over recent years while fishing mortality has been increasing rapidly, especially for large bluefin. The increase in mortality for large bluefin tuna is consistent with an apparent shift in targeting towards larger individuals destined for fattening and/or farming. Analyses indicate that recent (2003-2007) SSB is less than 40% of the highest estimated levels. The decline in SSB appears to be more pronounced during more recent years. The results are consistent between different types of models and all the analyses indicate a general recent increase in F for large fish and, consequently, a decline in SSB.

Estimates of current stock status relative to MSY benchmarks are uncertain, but current F is most likely at least 3 times that which would result in MSY and SSB_{2007}/ SSB_{msy} is most likely to be about 0.36 or less. The ICCAT-SCRS was unable to estimate F and SSB for 2008 and 2009 and no more-recent assessment is available.

RECENT MANAGEMENT ADVICE: In 2002, ICCAT fixed the TAC for the East Atlantic and Mediterranean bluefin tuna at 32,000 t per year for the period 2003 to 2006. The most recent ICCAT Rec. 08-05 established decreasing TACs: 29,500 t in 2007, 28,500 t in 2008, 22,000 t in 2009, 19,950 in 2010 and 18,500 t in 2011. However, Libya, Morocco and Tunisia were authorized to carry over into 2009 and 2010, their previous quota allocations that were not taken and Libya and Turkey disagreed with the allocation key accepted by other Contracting Parties to ICCAT and declared autonomous fishing quotas higher than their ICCAT allocation.

The available information indicated that the 2007 fishing mortality rate was, under the 2004-2007 overall fishing pattern, more than three times the level which would permit the stock to stabilize at the MSY level. The intention of [Rec. 06-05] and [Rec. 08-05] are seen as a step in the right direction, but as previously noted, the ICCAT consider that it is unlikely to fully fulfill the objective of the plan to rebuild the stock to the MSY level by 2023.

To address the various sources of uncertainties in the scientific diagnosis, especially regarding the data quality and availability, the ICCAT has investigated different quantitative approaches and it has considered a variety of scenarios for the projections. On this basis, the best advice of the ICCAT is currently to follow an $F_{0.1}$ (or another adequate FMSY proxy) strategy to rebuild the stock, because such strategies appear much more robust than [Rec. 06-05] and possibly to [Rec. 08-05] (according to preliminary analyses) to a wide range of uncertainties about the data, the current status and future productivity. These strategies would imply much lower catches during the next few years (on the order of 15,000 t or less), but the long-term gain could lead to catches of about 50,000 t with substantial increases in spawning biomass. For a long lived species such as bluefin tuna, it will take some time (> 10 years) to realize the benefit. The ICCAT further believes that a time area closure could greatly facilitate the implementation and the monitoring of such rebuilding strategies.

Clearly, an overall reduction in fishing effort and mortality, as stated in 2008, is needed to reverse current trends. The 2007 fishing capacity largely exceeds the 2007 TAC, but the 2008 catch capacity might be under 2008 TAC if illegal fishing did not occur. However, the potential catch capacity is clearly above TAC. Therefore, management actions need to be pursued to mitigate the impacts of overcapacity as well as to eliminate illegal fishing. Deferring effective management measures will likely result in even more stringent measures being necessary in the future to achieve the ICCAT objectives.

STECF COMMENTS: STECF agrees with the ICCAT-SCRS advice which corresponds to a total catch of 15,000 t or less for 2010.

STECF further notes that prior to 2008, poor or incomplete enforcement of adopted management plans has probably contributed to the current poor status of this stock, while the more stringent measures adopted by ICCAT Rec.08-05, if fully implemented and enforced should improve bluefin fishery management and benefit the stock. STECF recommends that management plans should take full account of the scientific advice and are adopted and fully implemented as a matter of urgency in all the bluefin tuna fisheries concerned.

STECF notes that existing fishing capacity, even after the reduction in 2009, exceeds that required to take catches of the level of recent TACs. STECF agrees with the ICCAT-SCRS that the minimum catch size should be set at 25 kg in order to avoid misreporting and/or discarded catches of mature fish between 25 kg and 30 kg.

STECF has noted the high degree of uncertainty surrounding much of the data used for the assessment of bluefin. Such uncertainty has been recognised by ICCAT-SCRS for a number of years and brings into question the reliability of the assessment as a basis for a realistic catch forecast. There remains an urgent need to have more reliable and complete size frequency data (particularly, but not only, for early year-classes 1 to 3) for the period following the introduction of a TAC in the Mediterranean. Tagging programs, fishery independent surveys and mining of historical data will all contribute to a better understanding of the status of this species and should be encouraged. STECF suggests that ICCAT should be encouraged to review its policy of using scientific data for compliance purposes, and that ICCAT task 2 data should be used for scientific purposes only. This may improve the availability, quality and reliability of data for stock assessment and provision of management advice.

STECF notes the recent publication of a new approach to bluefin tuna habitat mapping using daily sea surface chlorophyll and temperature from satellite remote sensors (Druon, 2009), which was presented during this meeting. The approach provides the possibility of identifying feeding and spawning habitats and is potentially a useful tool for real-time management of the fishery for bluefin, providing that data are correctly analysed and preliminary cross-checked with both scientific literature and fishery information. STECF considers that the approach is worthy of further consideration for a better understanding of the bluefin tuna movements in the Mediterranean and, possibly, for its management. A similar approach might be appropriate for other pelagic schooling species of commercial importance.

Special request on bluefin tuna

STECF is requested to address the following:

Based on the most recent information on stocks' status and management advice, STECF is requested to advise whether the stocks of bluefin tuna in the Atlantic Ocean and Mediterranean Sea are threatened with extinction

STECF response:

STECF notes that estimates of current stock status of the eastern Atlantic and Mediterranean bluefin tuna relative to MSY benchmarks are uncertain, but current F is most likely at least 3 times that which would result in MSY and SSB_{2007}/ SSB_{msy} is most likely to be about 0.36 or less. STECF also notes that based on the most recent ICCAT_SCRS assessment the stock biomass has the potential to increase given appropriate management. The ICCAT recommendations for future management is to follow a $F_{0.1}$ strategy which if adopted and fully implemented and enforced would imply much lower catches of the order of 15,000 t or less during the next few years, but the long term gain could lead to catches of about 50,000 t with substantial increases in spawning biomass. STECF concludes that if a $F_{0.1}$ strategy is followed, and providing appropriate management measures are implemented and rigorously enforced, the stock of bluefin tuna in the eastern Atlantic and Mediterranean has the potential to rebuild and is therefore not threatened with extinction.

10.2. Bluefin (*Thunnus thynnus*), Western Atlantic

FISHERIES: Western bluefin fisheries have been managed by TAC since the early eighties and catches were relatively stable around 2,500 t until 2001, increased in 2002 to 3,319 t and have been declining since then, reaching 1,624 t in 2007. In 2008, catches increased again to 2,015 t. Most of the catches are taken by vessels from the USA, Canada and Japan.

SOURCE OF MANAGEMENT ADVICE: The advisory body is ICCAT. The latest stock assessment is from 2008.

PRECAUTIONARY REFERENCE POINTS: None.

STOCK STATUS: The 2008 assessment was consistent with previous analyses in that spawning stock biomass (SSB) declined steadily between the early 1970s and 1992. Since then, SSB has fluctuated between 18% and 27% of the 1975 level. The stock has experienced different levels of fishing mortality (F) over time, depending on the size of fish targeted by various fleets. Fishing mortality on spawners (ages 8 and older) declined markedly between 2002 and 2007. Estimates of recruitment were very high in the early 1970s, and additional analyses involving longer catch and index series suggested that recruitment was also high during the 1960s. Since 1977, recruitment has varied from year to year without trend. The Committee noted that a key factor in estimating MSY-related benchmarks is the highest level of recruitment that can be achieved in the long term. Assuming that average recruitment cannot reach the high levels from the early 1970s, recent F (2004-2006) is about 30% higher than the MSY level and SSB is about half of the MSY level. Estimates of stock status are more pessimistic if a high recruitment scenario is considered (F/FMSY=2.1, B/BMSY=0.14). The 2008 assessment results are similar to those from previous assessments.

One important factor in the recent decline of fishing mortality on large bluefin is that the TAC has not been taken during this time period, due primarily to a shortfall by the United States fisheries that target large bluefin. Two plausible explanations for the shortfall were put forward previously by the Committee: (1) that availability of fish to the United States fishery has been abnormally low, and/or (2) the overall size of the population in the Western Atlantic declined substantially from the level of recent years. While there is no overwhelming evidence to favour either explanation over the other, the 2008 base case assessment implicitly favours the first hypothesis (regional changes in availability) because a large recent reduction in SSB is not estimated. Nevertheless, the Committee notes that there remains substantial uncertainty on this issue and more research needs to be done.

The SCRS cautions that the conclusions of the 2008 assessment do not capture the full degree of uncertainty in the assessments and projections. An important factor contributing to uncertainty is mixing between fish of eastern and western origin. Limited analyses were conducted of the two stocks with mixing. Depending on the types of data used to estimate mixing (conventional tagging or isotope signature samples) and modelling assumptions made, the estimates of stock status varied considerably. However, these analyses are preliminary and more research needs to be done before mixing models can be used operationally for management advice. Another important source of uncertainty is recruitment, both in terms of recent levels (which are estimated with low precision in the assessment), and potential future levels (the "low" vs "high" recruitment hypotheses which affect management benchmarks). Finally, the growth curve assumed in the analyses may be revised based on new information that has been collected.

RECENT MANAGEMENT ADVICE: ICCAT-SCRS has conducted medium-term (12-year) outlook assuming two alternative recruitment scenarios with associated B_{MSY} (management target) values: (i) average

levels observed for 1976-2004 and a lower value of B_{MSY} (ii) levels that increase as the stock rebuilds associated with a higher calculated value of B_{MSY}. The low recruitment scenario suggests that catch levels of 2,400 t will have about a 50% chance of rebuilding the stock by 2019 and catches of 2,000 t or lower will have greater than a 75% chance of rebuilding. If the high recruitment scenario is correct, then the western stock will not rebuild by 2019 even with no catch, although catches of 1,500 t or less are expected to immediately end overfishing (50% chance) and initiate rebuilding.

In 1998, the Commission initiated a 20-year rebuilding plan designed to achieve BMSY with at least 50% probability. The 2008 assessment indicated that the stock had not yet rebuilt as projected under the plan initially. The 2007 SSB was estimated to be 7% below the level of the Plan's first year.

In 2008, the Commission recommended a total allowable catch (TAC), inclusive of dead discards, of 1,900 t in 2009 and 1,800 t in 2010 [Rec. 08-04]. These TAC levels were projected to have a 75% chance of meeting the lower rebuilding targets under the "low recruitment" scenario, but less than a 50% chance of meeting the higher target under the "high recruitment scenario". As noted in 2008, the TAC should be lower if the assessment is positively biased or if there is management implementation error (both of which have occurred in the past). Analyses conducted during the Joint ICCAT-Canada Precautionary workshop as well as two subsequent analyses reviewed by the Committee (SCRS/2008/089, SCRS/2008/175) suggested that the projections made during past assessments were too optimistic. This is reinforced by the observation that, halfway through the rebuilding program, biomass was still below what it was at the beginning. Accordingly, the Committee continues to strongly advise against an increase in TAC.

As noted previously by the Committee, both the productivity of western Atlantic bluefin and western Atlantic bluefin fisheries are linked to the eastern Atlantic and Mediterranean stock. Therefore, management actions taken in the eastern Atlantic and Mediterranean are likely to influence the recovery in the western Atlantic, because even small rates of mixing from East to West can have significant effects on the West due to the fact that Eastern plus Mediterranean resource is much larger than that of the West.

STECF COMMENTS: STECF agrees with the advice from ICCAT-SCRS, and stresses the relevance of archival tagging and biological investigations, to better understand the stock mixing problem.

STECF notes that it may seem counterintuitive, that a model with lower recruitment manages to achieve Bmsy by 2019, whilst higher recruitment on the basis of a stock recruitment relationship does not reach Bmsy by the same date. However the simulations suggest the later scenario has a higher SSB in 2019 than the earlier one, but also a much higher reference level (Bmsy) due to the increased recruitment at the higher SSBs compared to the constant recruitment assumption. Consequently, for the model assuming a stock recruit relationship, the time to reach Bmsy requires significantly longer than a single generation.

STECF, even for the western bluefin tuna stock, notes the high uncertainty of the assessment, along with the urgent need to revise some fundamental biological and ethological parameters used as inputs for the model.

Special request on bluefin tuna

STECF is requested to address the following:

Based on the most recent information on stocks' status and management advice, STECF is requested to advise whether the stocks of bluefin tuna in the Atlantic Ocean and Mediterranean Sea are threatened with extinction

STECF response:

STECF notes that estimates of current stock status of the western Atlantic stock indicate that the stock is well below that which would support MSY and that current exploitation rates are well above F_{MSY}. Based on the most recent ICCAT-SCRS report on bluefin tuna (Doc. No. PA2-604 / 2009), STECF notes that the western bluefin stock has the potential to rebuild given appropriate management. The report states *"If there is perfect implementation of [Rec. 08-04] through the year 2019, projections indicate that it is almost certain that the stock will be higher in 2019 than it is in 2009 for both recruitment scenarios considered"*. Given that the stock has the potential to rebuild if ICCAT Rec. 08-04 is implemented and rigorously enforced, STECF concludes that the western Atlantic bluefin stock is not threatened with extinction

10.3. Albacore (*Thunnus alalunga*), North Atlantic Ocean

FISHERIES: The northern stock is exploited by surface fisheries targeting mainly immature and longline fisheries targeting immature and adult albacore. The main surface fisheries are carried out by EC fleets (Ireland, France, Portugal and Spain) in the Bay of Biscay, in the adjacent waters of the northeast Atlantic, and in the vicinity of the Canary and Azores Islands in summer and fall. The main longline fleet is the Chinese Taipei fleet which operates in the central and western North Atlantic year round.

Landings of Northern Albacore remained relatively stable at around 35,000 t/year between 1984 to 2000. Catches decreased to a low of 22,741 t in 2002 (primarily due to a decrease in catches in the surface fishery) and increased again thereafter, reaching a peak of 36,199 t in 2006. Total catch in 2008 was 20,359 t representing a decrease on the 2007 yield and the 2006 peak catch (36,989 t) and is the lowest catch recorded in recent decades. The surface fisheries accounted for the bulk of the total catch with 17,861 t reported in 2008 (88%).

SOURCE OF MANAGEMENT ADVICE: The advisory body is ICCAT. The most recent assessment for North Atlantic albacore was undertaken in 2009.

PRECAUTIONARY REFERENCE POINTS: None.

STOCK STATUS: Based on the 2009 assessment (which includes catch and effort since the 1930s and size frequency since 1959), ICCAT-SCRS consider that spawning stock has declined and is currently about one third of the peak levels estimated for the late 1940s. Estimates of recruitment to the fishery, although variable, have shown generally higher levels in the 1960s and earlier periods with a declining trend thereafter until 2007. The most recent recruitment is estimated to be the lowest for all the years of the evaluation although the magnitude of this year-class is highly uncertain in the latest year. The 2009 assessment indicates that the stock has remained below B_{MSY} (current SSB_{2007} is approximately 62% of SSB at MSY) since the late 1960's. Corresponding fishing mortality rates have been above F_{MSY} (current ratio F_{2007}/F_{MSY} is 1.05 which is only slightly higher than F_{MSY}).

The trajectory of fishing mortality and spawning stock biomass relative to MSY reference points, indicate the northern albacore stock may have been overfished (SSB/SSBMSY <1) since the mid-1980s.

RECENT MANAGEMENT ADVICE: In 1998 ICCAT limited fishing capacity (number of vessels) in this fishery to the average of 1993-1995; this recommendation remains in force. In 2001 ICCAT established a total allowable catch of 34,500 t for this stock: in 2003 this was extended to 2007. However reported catches for 2005 and 2006 (35,318 and 36,989 respectively) exceeded the TAC whereas the 2007 catch (21,863) were well below the TAC.

In 2007, ICCAT established a new TAC for 2008 and 2009 of 30,200 t. Reported catch for 2008 (20,225) is well below the TAC.

The 2009 ICCAT/SCRS assessment indicates that constant catches above 28,000 t will not result in stock rebuilding to MSY by 2020. In view of the 2009 assessment, and in order to achieve the ICCAT management objective by 2020, a level of catch of no more than 28,000 t is advised.

STECF COMMENTS: STECF interprets the advice from ICCAT to imply that constant catches below 28,000 t will achieve the ICCAT conservation objective of achieving BMSY by 2020. If this interpretation is correct, STECF agreed with the ICCAT-SCRS advice that catches should be restricted to no more than 28,000 t.

10.4. Albacore (*Thunnus alalunga*), South Atlantic Ocean

FISHERIES: Recent South Atlantic albacore landings can largely be attributed to four fisheries; surface baitboat fleets from South Africa and Namibia, and longline fleets of Brazil and Taiwan.

The surface fleets are entirely albacore directed and mainly catch juvenile and sub-adult fish (70-90 cm FL). These surface fisheries operate seasonally, from October to May, when albacore are available in coastal waters. Brazilian longliners target albacore during the first and fourth quarters of the year, when an important concentration of adult fish (> 90 cm) is observed off the northeast coast off Brazil. The Taiwanese longline fleet operates over a larger area and throughout the year, and consists of vessels that target albacore and vessels that take albacore as by-catch, in bigeye directed fishing operations. On average, the longline vessels catch larger albacore (60-120 cm) than the surface fleets.

Total reported albacore landings in 2008 were 18,576; a decrease of about 1,500 t compared to the 2007 catch. The Taiwanese catch in 2008 was 9,966 t, a decrease of 3,180 t compared with 2007. This decrease is associated with the oil price rise in 2008 that saw a decrease in fishing effort targeting southern albacore.

SOURCE OF MANAGEMENT ADVICE: The advisory body is ICCAT. The management is based on assessments of stock status using catch rates effort and size.

PRECAUTIONARY REFERENCE POINTS: Replacement yield is set at about 28,800 t (25,800-29,300 t), with a maximum sustainable yield estimated at 33,300 t (29,900-36,700 t).

STOCK STATUS: Based on the 2007 assessment which considers catch, size and effort since the 1950s, the view of the status of southern albacore stock is that the spawning stock has declined to about 25% of its unfished level in 2005. ICCAT concluded that it is likely that the stock was below the maximum sustainable yield (MSY): it was estimated to about 90% of B_{MSY} in 2005, while the 2005 fishing mortality rate was about 60% of F_{MSY}. MSY was estimated to be around 33,300 t, whereas the replacement yield averaged over the last 10 years, is approximately 29,000 t.

The outlook for the stock, based on the current assessment, is for SSB to increase from the levels estimated in 2005 over the next few years. This outlook assumes catches remain below the estimated replacement yield of 29,000 t

RECENT MANAGEMENT ADVICE: The first TAC for this stock was established by ICCAT in 1999 and for 2001 – 2003 the TAC was set at 29,200 t. In 2007, ICCAT recommended [Rec. 07-03] a catch limit of 29,900 t (the lowest estimate of MSY) until 2011. Catches in 2007 and 2008 (20,274 and 18,576 respectively) were well below this TAC.

The 2005 assessment indicates that this stock was overfished but that catches in the order of those seen in 2006 (24,452 t), would recover the stock. The observed 2008 catch of 18,902 t is well below the TAC, the 2006 catch, and the replacement yield (28,800 t).
ICCAT/SCRS considered that the current management regulations are sufficient for the recovery of the southern stock.

STECF COMMENTS: STECF agrees with the advice from ICCAT.

10.5. Albacore (*Thunnus alalunga*), Mediterranean Sea

FISHERIES: Albacore fishing is a traditional activity for a number of fleets in the Mediterranean including those of Cyprus, Greece, Italy, Spain, and Malta (France has a sporadic fishery entirely dependent upon the presence of the albacore in the Liguro-Provencal basin). ICCAT statistics, however, are considered quite incomplete since many years, due to unreported catches from several countries and the lack of data in some years from other countries Even though catches of Mediterranean albacore have been increasing for the past few years, there is a lack of general information on this stock. The data from the fisheries are incomplete and biological information of the stock is limited. Reported albacore catches in the Mediterranean since 1982 have fluctuated between 1,235 t in 1983 and 7,894 t in 2003. The 2005 catches account only for 3,529 t, reaching 5,947 t in 2006. In 2007, the reported catches account 6,546 t and they were obtained mainly by long-lines (4,113t), other surface gears (1,400 t) and purse seines (1,033 t). STECF believes that even catches reported as "purse-seines" might be referred to other surface gears, including gillnets. EC-Italy has the highest catch in this fishery (4,017 t in 2007). Preliminary and incomplete catch reports in 2008 show only 2,586 t, again with Italy declaring the highest catch (2,104 t, equal to 81.3% of the provisional catch). Even if this figure is preliminary and incomplete, it is evident a strong reduction of catches in all those Countries reporting them. The annual average catch was 3,555 in the period 1983-2004 and 5,347 t in the period 2005-2007, showing an average increase of 50,4% when compared with the previous 22 year catches. The driftnet fishery for albacore has been banned since January 1st 2002 in the EC countries and from 2004 in all the ICCAT Mediterranean countries, but it is known that illegal fishing activity still occurs in some areas.

SOURCE OF MANAGEMENT ADVICE: The advisory bodies are ICCAT and FAO/GFCM, through the ICCAT/GFCM expert consultation.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: Due to the lack of adequate data, an assessment of the Mediterranean stock has never been carried out by the ICCAT. Many countries, are not yet reporting any catch for this species, and this fact is still

preventing the assessment. However the Mediterranean stock does not show any general trend. The average size is almost stable. The mixing rate with the Atlantic stock appears to be insignificant.

RECENT MANAGEMENT ADVICE: The ICCAT-SCRS was not in a position to provide advice on the status of this stock due to the lack of information. An ICCAT meeting to revise the Mediterranean data is planned in spring 2010.

There are no ICCAT regulations directly aimed at managing the Mediterranean albacore stock.

STECF COMMENTS: STECF notes that data collection for this species is mandatory within the EC data collection framework. STECF additionally strongly supports the previous recommendation of the ICCAT/SCRS concerning the collation of historical data. STECF notes that catch data before 1995 are not representative of the removals at that time and in some cases no estimates are available for various countries. STECF notes that even a preliminary analysis of the data to examine trends for those fisheries having sufficient data series would potentially be useful.

10.6. Yellowfin (*Thunnus albacares*), Atlantic Ocean

FISHERIES: Yellowfin tuna are caught between 45ºN and 40ºS by surface (purse seine, baitboat, troll and handline) and sub-surface gears (longline). In contrast to the increasing catches of yellowfin tuna in other oceans worldwide, there has been a steady decline in overall Atlantic catches, of 63% between 2001-2007. This was followed by a small increase of ~8% in 2008 (relative to 2007). Total recorded landings of YFT in 2008 were 107,277 t. The purse seine fishery is the major contributor to total catches of this species. Landings from baitboats and purse seiners generally declined between 2001-2007. Landings from other surface gears remained relatively stable. Landings from longliners fluctuated but remained relatively stable overall in this period. In 2008, landings increased somewhat, e.g. landings from the purse seine fleet increased by 35% in 2008 (relative to 2007). Of the total landings in 2008 the purse seine fisheries contributed 70,047 t (65%), long line catches were 20519 t (19%) and bait boat catches were 12525 t (12%). Baitboat catches declined markedly between 2001 and 2007, largely because of reduced catches by Ghana baitboats, which resulted from a combination of reduced days fishing, a lower number of operational vessels, and the observance of the moratorium on fishing using floating objects. There was a rise in catches from baitboats in 2008 (30% increase relative to 2007). In the western Atlantic, both purse seine catches and bait boat catches have declined strongly. However both in the east and west Atlantic longline catches have remains more or less stable in recent years. The observed increase in South African catches in the eastern Atlantic during 2005 and 2006 may be the result of a spillover of Indian Ocean fish caught just inside the Atlantic boundary.

SOURCE OF MANAGEMENT ADVICE: The advisory body is ICCAT.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: The Atlantic YFT stock was assessed in 2008, at which time catch and effort data up to and including 2006 were available. Methods used were cohort analyses (VPA) and production models (ASPIC). The two models leave a small amount of uncertainty about the stock status. Results from VPA gave an (F_{2006}/F_{MAX}) of 0.84, and a relative biomass (B_{2006}/B_{MAX}) of 1.09. The estimates by the ASPIC were (F_{2006}/F_{MSY}) = 0.89 and (B_{2006}/B_{MSY}) = 0.83. ICCAT states that 2006 catches are estimated to be well below MSY levels, stock biomass is estimated to be near the Convention Objective and recent fishing mortality rates somewhat below F_{MSY}. The recent trends indicate declining effective effort and some recovery of stock levels. However, when the uncertainty around the point estimates from both models is taken into account, there is still about a 60% chance that stock status is not consistent with Convention objectives.

RECENT MANAGEMENT ADVICE: The status of yellowfin has shown some improvement since the last assessment, which is not surprising given the period of reduced catches and fishing effort. Currently, stock biomass is estimated to be near the Convention Objective and recent fishing mortality rates somewhat below F_{MSY}. Effort increases of the order of about 10% above current levels (in order to achieve MSY), would be expected in the long run to increase yield by only about 1-4% over what could be achieved at current effective effort levels. However, this would lead to a substantially increased risk of biomass falling below the Convention objective. In addition, the Commission should be aware that increased harvest of yellowfin could have negative consequences for bigeye tuna in particular, and other species caught together with yellowfin in fishing operations taking more than one species. The Committee also continues to recommend that effective measures be found to reduce fishing mortality of small yellowfin to increase long-term sustainable yield.

STECF COMMENTS: STECF notes that catches increased in 2008, which may represent the reversal of the previous period of declining catches. If catch rates continue to increase this reduces confidence that biomass will be somewhat above B_{MSY}.

ICCAT-SCRS noted that catch levels in recent years have been held in check, despite increasing efficiencies of individual vessels, by a continued decline in the number of purse seine vessels in the eastern Atlantic. STECF agrees that a continuation of the recent movement of additional newer vessels from the Indian Ocean into the Atlantic, with a corresponding increase in fishing mortality, the situation should be monitored closely to avoid adverse impacts on stock status.

10.7. Bigeye (*Thunnus obesus*), Atlantic Ocean

FISHERIES: Total landings in 2008 of Bigeye tuna in the Atlantic are currently estimated were around 70,000 t. Catches have been increasing from a low in 2006 (65,873 t) reaching 79,597 t in 2007, but still at much lower levels than in the 1990s. In the Atlantic this stock is exploited by three major gears/fisheries: longline, purse seine and baitboat (live bait). In 2007, the last year of confirmed landings, total landings were distributed by these 3 fisheries as follows: 42,037 t (63%) by long line, 13150 t (17%) by purse seine and 11549 t (17%) by bait boats. The decline in total catches since 1999 is mainly due to declines in the long line catches.

The total annual catch increased up to the mid 1970s reaching 60,000 t and fluctuated over the next 15 years. In 1991, catch surpassed 95,000 t and continued to increase, reaching an historic high of about 132,000 t in 1994. Since 1999 reported and estimated catch has been declining and fell below 100,000 t in 2001, but appears to have stabilized at levels around 70,000t since then.

SOURCE OF MANAGEMENT ADVICE: The advisory body is ICCAT. Although several types of assessment models, including production models, VPA, and a statistical integrated model (Multifan-CL) have been used, the results from non-equilibrium production models seem to me most consistent with previous assessments of Atlantic bigeye, and these models are thus used to provide our best characterization of the status of the resource.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: Consistent with previous assessments of Atlantic bigeye, the results from non-equilibrium production models are used to provide our best characterization of the status of the resource. The current MSY estimated using two types of production models was around 90,000 t and 93,000 t, although uncertainty in the estimates broadens the range. In addition, these estimates reflect the current relative mixture of fisheries that capture small or large bigeye; MSY can change considerably with changes in the relative fishing effort exerted by surface and longline fisheries.

The biomass at the beginning of 2006 was estimated to be nearly 92% of the biomass at MSY and the 2005 fishing mortality rate was estimated to be about 13% below the fishing mortality rate at MSY. The replacement yield for the year 2006 was estimated to be slightly below MSY.

RECENT MANAGEMENT ADVICE: This assessment results indicated that the stock declined rapidly during the 1990s due to the large catches taken in that period, and recently it has stabilized at around or below the level that produces MSY in response to a large reduction in reported catches. Estimated fishing mortality exceeded FMSY for several years in the period of the mid-1990s and rapidly reduced since 1999. Projections indicate that catches reaching 85,000 t or less will permit the stock to rebuild in the future. The Commission should be aware that if major countries were to take the entire catch limit set under Recommendation 04-01 and other countries were to maintain recent catch levels, then the total catch could well exceed 100,000 t. The Committee recommends that the total catch does not exceed 85,000 t.
The assessment and subsequent management recommendations are conditional on the reported and estimated history of catch for bigeye in the Atlantic. The Committee reiterates its concern that unreported catches from the Atlantic might have been poorly estimated and continues this way, but available statistical data collection mechanisms are insufficient to fully investigate this possibility. Coordination amongst the tuna RFMOs should be encouraged, among other objectives, examining the possibility of 'fish laundering' for bigeye and other species.

STECF COMMENTS: STECF agrees with the advice from ICCAT/SCRS.

10.8. Swordfish (*Xiphias gladius*), North Atlantic

FISHERIES: Atlantic swordfish has a broad geographical distribution, (from 45ºN to 45ºS, both coastal and offshore) and is available to a large number of fishing countries. The largest proportion of Atlantic catches are made using surface drifting longlines, mostly by Spain, United States, Canada and Portugal. However, many additional gears are used. Since a 1987 peak in landings there was a decrease in estimated catches in the North Atlantic until 2002. This was in response to ICCAT recommendations but also attributed to shifts in fleet distributions, including movement of some vessels to the South Atlantic and out of the Atlantic.

For the past decade, the North Atlantic estimated catch (landings plus dead discards) has averaged about 11,332 t per year. The catch in 2008 (10,752) represents a 53% decrease since the 1987 peak in North Atlantic landings (20,236 t). These reduced landings have been attributed to ICCAT regulatory recommendations and shifts in fleet distributions, including the movement of some vessels some years to the South Atlantic or out of the Atlantic. In addition, some fleets, including at least the United States, EC-Spain, EC-Portugal and Canada, have changed operating procedures to opportunistically target tuna and/or sharks, taking advantage of market conditions and higher relative catch rates of these species previously considered as by-catch in some fleets. Recently, socio-economic factors may have also contributed to the decline in catch.

The nominal catch rates by fleets contributing to the production model series have an increasing trend since the late 1990s, but the United States catch rates remained relatively flat. There have been some recent changes in United States regulations which may have impacted catch rates, but these effects remain unknown.

The most frequently occurring ages in the catch include ages 2 and 3. There are reports of increasing average size of the catch in some North Atlantic fisheries, including United States and Canada.

SOURCE OF MANAGEMENT ADVICE: The advisory body is the ICCAT.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been defined for this stock.

STOCK STATUS: The estimated relative biomass trend in the base case model shows a consistent increase since 2000. The current results indicate that the stock is at or above BMSY. The relative trend in fishing mortality shows that the level of fishing peaked in 1995, followed by a decrease until 2002, followed by small increase in the 2003-05 period and downward trend since then. Fishing mortality has been below FMSY since 2005. The results suggest that there is greater than 50% probability that the stock is at or above BMSY, and thus the ICCAT rebuilding objective has been achieved.

However, it is important to note that since 2003 the catches have been below the TACs greatly increasing chances of a fast recovery. Overall, the stock was estimated to be somewhat less productive than the previous assessment, with the intrinsic rate of increase, r, estimated at 0.44 compared to 0.49 in 2006.

Other analyses conducted by the ICCAT-SCRS (Bayesian surplus production modeling, and Virtual Population analyses) generally support the results described for the base case surplus production model above.

RECENT MANAGEMENT ADVICE: ICCAT SCRS Advice for 2010: Consistent with the goal of the Commission's swordfish rebuilding plan [Rec. 96-02], in order to maintain the northern Atlantic swordfish stock at a level that could produce MSY with greater than 50% probability, the Committee recommends reducing catch limits allowed by Rec. 06-02 (15,345 t) to no more than 13,700 t. This reflects the current best estimate of maximum yield that could be harvested from the population under existing environmental and fishery conditions. Should the Commission wish to have greater assurance that future biomass would be at or above BMSY while maintaining F at or below FMSY, the Commission should select a lower annual TAC, depending on the degree of precaution the Commission chooses to apply in management.

The Committee noted that allowable catch levels agreed in [Recs. 06-02 and 08-02] exceeded scientific recommendations. The successful rebuilding of this stock could have been compromised if recent catches had been higher than realized.

STECF COMMENTS: STECF agrees with the advice from ICCAT.

STECF notes the concern expressed by ICCAT/SCRS that current regulations may have had a detrimental effect on the availability and consistency of data (catches, sizes, and CPUE indices) from the Atlantic fleet and the possible effects of this on future assessments.

STECF further notes that, because of the poor size-selectivity of longliners, regulating minimum landing size may inadvertently have resulted in under-reporting of juvenile catches. Alternative methods for reducing juvenile catches, such as time and/or area closures or technological changes in gear deployment, may be more effective and their utility should be further investigated.

10.9. Swordfish (*Xiphias gladius*), South Atlantic

FISHERIES: The historical trend of catch (landings plus dead discards) can be divided in two periods: before and after 1980. The first one is characterized by relatively low catches, generally less than 5,000 t (with an average value of 2,300 t). After 1980, landings increased continuously up to a peak of 21,930 t in 1995, levels that match the peak of North Atlantic harvest (20,236 t). This increase of landings was, in part, due to progressive shifts of fishing effort to the South Atlantic, primarily from the North Atlantic, as well as other waters. Expansion of fishing activities by southern coastal countries, such as Brazil and Uruguay, also contributed to this increase in catches. The reduction in catch following the peak in 1995 resulted from regulations and partly due to a shift to other oceans and target species. In 2008, the 11,108 t reported catches were about 51% lower than the 1995 reported level.

As observed in the 2006 assessment, the CPUE trend from targeted and non-targeted fisheries show different trends and high variability which indicates that at least some are not depicting trends in the abundances of the stock . It was noted that there was little overlap in fishing area and strategies between the by-catch and targeted fleets used for estimating CPUE pattern, and therefore the by-catch and targeted fisheries CPUE trends could be tracking different components of the population.

Since 1991, several fleets have reported dead discards. The volume of Atlantic-wide reported discards since then has ranged from 215 t to 1,139 t. The most recent (2008) reported level of dead discards is 244 t, a reduction of 79% from the peak level reported for 2000.

SOURCE OF MANAGEMENT ADVICE: The advisory body is the ICCAT.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: The results of the base case production model indicated that there were conflicting signals for several of the indices used. The model estimated overall index was relatively stable until the early 1980s when it started declining until the late 1990's and it reversed that trend about 2003. Estimated relative fishing mortality (F2008/FMSY) was 0.75 indicating that the stock is not being overexploited. Estimated relative biomass (B2009/BMSY) was 1.04, indicating that the stock was not overexploited.

Because of the high level of uncertainty associated with the south Atlantic production models results, the SCRS conducted catch-only modeling analysis, including two explorations using different assumptions concerning the intrinsic rate of population increase. The distribution for MSY was skewed for both runs. The median of MSY estimated for RUN 1 was 18,130 t and for RUN 2 was 17,934 t.

RECENT MANAGEMENT ADVICE: Until sufficiently more research has been conducted to reduce the high uncertainty in stock status evaluations for the southern Atlantic swordfish stock, the Committee emphasizes that annual catch should not exceed the provisionally estimated MSY (15,000). Considering the unquantified uncertainties and the conflicting indications for the stock, the Committee recommends a more precautionary Fishery Management approach, to limit catches to the recent average level (~15,000 t), which are expected to maintain the catch rates at about their current level.

STECF COMMENTS: STECF agrees with the advice from ICCAT. There is a need to evaluate the uncertainty concerning the stock structure of Atlantic swordfish. STECF notes the concern of ICCAT/SCRS that current regulations may have had a detrimental effect on the availability and consistency of scientific data on catches, sizes and CPUE indices of the Atlantic fleet and the possible effects for future assessments. STECF also notes that new minimum size regulations came into effect in 2007, but their effectiveness can not be assessed at present.

10.10. Swordfish (*Xiphias gladius*), Mediterranean Sea

FISHERIES: Swordfish fishing has been carried out in the Mediterranean using harpoons and driftnets since ancient times. Mediterranean swordfish fisheries are characterized by high catch levels with average annual reported catches similar to those of larger areas such as the North Atlantic. Landings showed an upward trend from 1965-72, which become stabilised between 1973 and 1977, and then resumed an upward trend reaching a peak of about 20,000 t in 1988. Since then, the reported landings have declined and since 1990 they fluctuate from about 12,000 t to 16,000 t. The total 2006 reported catch is 14,893 t while 20007 reported catch is 14,227 t. Preliminary and incomplete 2008 reported catches are 11,153 t. The biggest producers of swordfish in the Mediterranean Sea in the recent years are, in the order, EC-Italy, EC-Greece, EC-Spain and Morocco. Also, Algeria, EC-Cyprus, EC-Malta, EC-Portugal, Tunisia and Turkey have fisheries targeting swordfish in the Mediterranean. Incidental catches of swordfish have also been reported by Albania, Croatia, EC-France, Japan, and Libya. There may be additional fleets taking swordfish in the Mediterranean, for example, Egypt, Israel, Lebanon, Monaco and Syria, but the data are not always reported. Prior to 2002 longlines and driftnets were the main gears used, but minor catches were also reported by harpoon, traps and sport fishing. The driftnet fishery for swordfish has been banned since January 1st 2002 in EU countries and from 2004 in all ICCAT Mediterranean countries (in Morocco the driftnet fishery is still permitted, within a progressive dismissing plan), but illegal fishing is known to still occur in various areas. The use of nets and longlines in sport and recreational fishery was banned from 2004 (ICCAT Rec. 04-12). ICCAT imposed a Mediterranean-wide one month fishery closure for all gears targeting swordfish in 2008. A two months closure was adopted for 2009, but only for pelagic longlines directly targeting swordfish (ICCAT Rec.08-03). Additionally, several countries have imposed technical measures, such as closed areas and seasons, minimum landing size regulations and license control systems. There is a high and growing demand for swordfish for fresh consumption in most Mediterranean countries.

SOURCE OF MANAGEMENT ADVICE: The advisory bodies are ICCAT and GFCM through the joint GFCM/ICCAT working groups.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: In 2003 the SCRS carried out the first assessment of the Mediterranean stock based on fisheries data from the central and eastern Mediterranean. The most recent assessment was carried out in 2007.

The results from a workshop on stock structure in 2006 demonstrated that Mediterranean swordfish compose a separate stock to swordfish in the Atlantic but further research is needed to clearly define stock boundaries and the degree of any stock mixing. The stock assessment carried out in 2007 used two different methods. These gave a consistent view of declining stock abundance, but differed in the extent of the decline. Estimates of population status from production modelling using a longer time-series of catch and effort (a series for which SCRS has less confidence) indicated a 2005 stock level that was most likely about 13% below that necessary to achieve the ICCAT Convention objective while recent fishing mortality was about 25% above the level that would permit the stock to attain MSY levels. Estimates of stock status from virtual population analysis using a shorter time series of catch and effort data (for which ICCAT has more confidence), indicated about a 40% reduction in spawning stock level but a stable recruitment over the past 20 years. That spawning stock level is less than half that necessary to achieve the ICCAT Convention objective and estimates of recent fishing mortality rates from this form of assessment are more than twice that which, if continued without abatement, is expected to drive the spawning biomass to a very low level (about 10% SPR) within a generation. Those low levels are considered to give rise to non-negligible risks of rapid declines in the stock although such a signal has not yet been observed in the Mediterranean swordfish fisheries. While one modelling approach indicates the current stock status is only about 13% below B_{MSY}, it also indicates that future catches in excess of 12,000 t will not result in improvement in stock status. In contrast, the modelling approach that provides a more pessimistic view of current status (less than half B_{MSY}) indicates future catches that allow rebuilding are somewhat higher, up to about 14,000 t, assuming that the current high selectivity for juvenile fish continues and recruitment does not improve. The SCRS again noted the large catches of small size swordfish, i.e., less than 3 years old (many of which have probably never spawned) and the relatively low number of large individuals in the catches. Fish less than three years old usually represent 50-70% of the total yearly catches in terms of numbers and 20-35% in terms of weight. A reduction of the volume of juvenile catches would improve yield per recruit and spawning biomass per recruit levels.

RECENT MANAGEMENT ADVICE: SCRS has recommended that ICCAT should adopt a Mediterranean swordfish fishery management plan with the goal of rebuilding the stock to levels that are consistent with the ICCAT Convention objective. One technical measure the SCRS has thus far evaluated is Mediterranean – wide fishing closures during the recruitment period, which could initiate rebuilding, depending on their duration and timing. Considering the estimated statistical uncertainty, gains in terms of landings and SSB from short fishery closures (e.g. one month) will be negligible. In contrast, relatively long (over three months) Mediterranean-wide closures in the last two quarters of the year would result in important long term gains, which are more profound in the case of SSB. The ICCAT convention objectives concerning SSB, however, can only be met with Mediterranean-wide drastic closures in the last two quarters of the year (i.e. six months). Such closures would result in short term decreases in landings. These effects would be diminished if closure is applied in months of low fishing activity (December-January). Following the results from recent studies, technical modifications of the longline fishing gears as well as the way they are operated can be considered as an additional technical measure in order to reduce the catch of juveniles. The SCRS recommends this type of measures be considered as part of a Mediterranean swordfish management plan. It is evident from the stock status evaluation that the current capacity in the Mediterranean swordfish fishery exceeds that needed to efficiently extract MSY. Management measures aimed at reducing this capacity should also be considered part of a Mediterranean swordfish management plan adopted by the ICCAT. In addition, future analyses of management measures should include economic aspects. Further, the SCRS recommends that national scientific delegations conduct additional research into technical measures and time-area closures which could optimize protection of juvenile Mediterranean swordfish. Given the uncertainty of the location of the boundary between the Mediterranean and North Atlantic stocks, it is important to identify the biological origin of those catches reported at or near the boundary so that the resulting knowledge can be considered in the management of the North Atlantic and/or Mediterranean stocks.

STECF COMMENTS: STECF notes that assessment models used by the ICCAT SCRS give different perceptions of the stock status in relation to B_{MSY}. While both models indicate that the biomass is below B_{MSY}, the degree to which the stock is overfished is substantially different in the two models. STECF agrees with the finding that the stock is overfished but is unable to quantify by how much it is overfished. Nevertheless, STECF broadly agrees with the advice from ICCAT regarding fishery closures and recommends that any fishery closure (no fishing with all surface longlines able to catch swordfish and eradication of all illegal driftnet fisheries) should apply to the entire Mediterranean area and extend for a minimum of two months. STECF notes that to achieve the ICCAT objectives for swordfish, the closure should be for a period greater than 2 months. STECF also recommends that fishing capacity for swordfish should not be allowed to increase and preferable that it be reduced. STECF also indicates the EU Data Collection framework should be adjusted to be consistent with the format used by ICCAT for assessment purposes, with particular attention to CPUE data. STECF again stresses the importance to better define the mixing rate between the Mediterranean and the Atlantic swordfish stock already known to occur in the Atlantic area close to Gibraltar.

10.11. Skipjack (Katsuwonus pelamis), Eastern Atlantic

FISHERIES: The total catches obtained in 2008 in the entire Atlantic Ocean were close to 149,000 t which represents the catch average of the last five years. The numerous changes that have occurred in the skipjack fishery since the early 1990s (such as the use of FADs and the expansion of the fishing area towards the west) have brought about an increase in skipjack catchability and in the proportion of the skipjack stock that is exploited. At present, the major fisheries are the purse fisheries, particularly those of EC-Spain, EC-France, NEI, Cape Verde, Guatemala and Ghana, followed by baitboat fisheries of Ghana, EC-Spain and EC-France. The preliminary estimates of catches made in 2008 in the East Atlantic amounted to 127,000 t, representing an increase of 3% as compared to the average of 2003-2007. The estimate of the average discard rate of skipjack tuna under FADs from data collected since 2001 by observers on-board Spanish purse seiners operating in the East Atlantic has been confirmed by the two new studies conducted on board French purse seiners (estimated at 42 kg per ton of skipjack landed). Furthermore, this last study showed that the amount of small skipjack (average size 37 cm FL) landed in the local market of Abidjan in Côte d'Ivoire as "*faux-poisson*" is estimated at 235 kg per ton of skipjack landed (i.e. an average of 6,641 t/year between 1988 and 2007).

In 2002 ICCAT reviewed the current stock structure hypothesis of two separate management units, East and West Atlantic, separated at 30°W. In recent years the East Atlantic fisheries have extended to the West of 30°, following the drift of FADs. This would imply the possibility of a certain degree of mixing.

SOURCE OF MANAGEMENT ADVICE: The advisory body is ICCAT.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: Stock assessments for eastern and western Atlantic skipjack were conducted in 2008 using available catches to 2006. Skipjack had only been assessed previously in 1999. Although the fisheries operating in the east are extending towards the west beyond 30°W longitude, the SCRS decided to maintain the hypothesis in favor of two distinct stock units, based on available scientific studies. However, taking into account the biological characteristics of the species and the geographic distances between the various fishing areas, the use of smaller stock units continues to be the envisaged hypothesis.

A Bayesian method, using only catch information estimated the MSY (under a Schaefer-type model parameterization) at 143,000-156,000 t, a result which agrees with the estimate obtained by the modified Grainger and Garcia approach: 149,000 t.

In addition, two non-equilibrium surplus biomass production models (a multi-fleets model and a Schaefer-based model) were applied for 8 time series of CPUEs, and for a combined CPUE index weighted by fishing areas. To account for the average increase in catchability of purse seine fisheries, a correction factor of 3% per year was applied to the CPUE series. As for the bayesian model application that only uses catches, different working hypothesis were tested on the distribution of the priors of the two surplus production models (i.e., the growth rate, the carrying capacity, the catchability coefficient of each fleet, etc.). In general, the range of plausible MSY values estimated from these models (155,000-170,000 t) were larger than in the bayesian model based on catches. The Committee stated the difficulty to estimate MSY under the continuous increasing conditions of the exploitation plot of this fishery (one-way of the trajectory to substantially weaker effort values) and which as a result, the potential range distribution of some priors needs to be constrained (e.g., for growth rate, or for the shape parameter of the generalized model).

Although some caution is needed as regards to the generalization of the status to the overall stocks in the East Atlantic, due to the moderate mixing rates that seem to occur among the different sectors of this region, it is unlikely that skipjack be over exploited in the eastern Atlantic

MANAGEMENT MEASURES : The effects of the establishment of a time/area closure of the surface fishery [ICCAT Rec. 04-01], which replaces the old strata relative to the moratorium on catches under floating objects were analysed during the species Group meeting.

Considering that the new closed area is much smaller in time and surface than the previous moratorium time/area, and is located in an area which historically has lower effort anyway, this regulation is likely to be less effective in reducing the overall catches of small bigeye (the species for which the regulation was applied) by the surface fishery. When the fishing effort for the EC purse seine fleet was at its maximum value (period 1994-1996, i.e., before the implementation of the first moratorium), the skipjack catch from this fleet within the time and area limits defined by Rec. 04-01, was only on average at 7,180 t (i.e., 7.5% of the total skipjack catch from the EC purse seiners).

RECENT MANAGEMENT ADVICE: Although ICCAT/SCRS makes no management recommendations in this respect, catches should not be allowed to exceed MSY. The Commission should be aware that increasing harvests and fishing effort for skipjack could lead to involuntary consequences for other species that are harvested in combination with skipjack in certain fisheries.

STECF COMMENTS: STECF noted that the effect of the ICCAT decision to replace the previous moratorium on the use of FADs by a season/area closure was assessed and that the conclusion was that it is less efficient in reducing the overall catches of small bigeye and has only a marginal effect on skipjack catches.

10.12. Skipjack (Katsuwonus pelamis), Western Atlantic

FISHERIES: In the West Atlantic, the major fishery is the Brazilian baitboat fishery, followed by the Venezuelan purse seine fleet. Catches in 2008 in the West Atlantic amounted to 22,000 t, i.e. representing a decrease of 17% as compared to the trend observed for recent years. The catches taken by EU vessels on this stock have been, historically, negligible.

SOURCE OF MANAGEMENT ADVICE: The advisory body is the ICCAT.

PRECAUTIONARY REFERENCE POINTS: No reference points have been defined for this stock.

STOCK STATUS: Stock assessments for eastern and western Atlantic skipjack were conducted in 2008 using available catches to 2006. Skipjack had only been assessed previously in 1999.In 2002 the current stock structure hypothesis that consists of two separate management units, one in the East Atlantic and another in the West Atlantic, separated at 30°W was reviewed (see Skipjack, eastern Atlantic). The standardised CPUEs of Brazilian baitboats remain stable while that of Venezuelan purse seiners and USA rod and reel decreased in recent years. This decrease, also observed in the yellowfin CPUE time series, could be linked to specific environmental conditions (high surface temperatures, lesser accessibility of prey). The average weight of skipjack caught in the western Atlantic is higher than in the east (3 to 4.5 kg vs. 2 to 2.5 kg), at least for the Brazilian baitboat fishery.

Catch only model estimated MSY at around 30,000 t (similar to the estimate provided by the Grainger and Garcia approach) and the Bayesian surplus model (Schaefer formulation) at 34,000 t. Other analyses using Multifan-CL indicated MSY convergens to about 31,000-36,000 t. It must be stressed that all of these analyses correspond to the current geographic coverage of this fishery (i.e., relatively coastal fishing grounds due to the deepening of the thermocline and of the oxycline to the East).

For the western Atlantic stock, in the light of the information provided by the trajectories of B/B_{MSY} and F/F_{MSY}, it is unlikely that the current catch is larger than the current replacement yield .

RECENT MANAGEMENT ADVICE: No management recommendations were proposed by the ICCAT.

STECF COMMENTS: No comment.

10.13. Marlins (*Makaira nigricans* and *Tetrapturus albidus*), Atlantic Ocean

FISHERIES: The ICCAT/SCRS used Task I catches as the basis for the estimation of total removals. In recent years large catches of billfish continue to be reported as unclassified billfish and reporting gaps remain for some important fleets. Total removals for the period 1990-2004 were obtained by modifying Task I values with the addition of blue marlin and white marlin that the SCRS estimated from catches reported as billfish unclassified. Additionally the reporting gaps were filled with estimated values for some fleets. In recent times new fleets have harvested large catches of blue marlin, including the artisanal FAD fisheries in the eastern Caribbean islands and a new artisanal fleet of small longliners operating off Brazil between 20°S and 26°S. During the 2006 marlin assessment it was noted that catches of blue marlin and white marlin continued to decline through 2004. Task I catches of blue marlin in 2006 were 2,182 t, reaching 3,082 t in 2007 and 3,484 t in 2008. Task I catches of white marlin in 2006 and 2007 were 385 t and 18 t, respectively, while they have been estimated 377 t in 2008. Task I catches of white marlin and blue marlin for 2008 are preliminary and incomplete, because they do not include reports from several important fleets, including some of the eastern Caribbean fleets that have reported large catches of blue marlin in the past. Historical reports of unclassified billfish remain an important issue in the estimation of historical removals from marlin stocks.

These species are primarily taken by longline fisheries (including various EU longline fisheries), but also by purse seines (including EU purse seiners catching a few hundreds tonnes yearly), by some artisanal gears which are the only fisheries targeting marlins (Ghana, Cote d'Ivoire, including EU ones in the Antilles) and also by various sport fisheries located in both sides of the Atlantic. This group of species, together with spearfish and sailfish, is becoming important in the Atlantic because of their charismatic status and the sport fisheries lobby (and because of the latter's active financial support to the ICCAT scientific researches on these species). The increasing use of anchored FADs by various artisanal and sport fisheries is increasing the vulnerability of these stocks.

SOURCE OF MANAGEMENT ADVICE: The advisory body is ICCAT.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for these stocks.

STOCK STATUS:

BLUE MARLIN: No new information on stock status has been provided since the 2006 assessment. The recent biomass level most likely remains well below the B_{MSY} estimated in 2000. Current and provisional diagnoses suggest that F has recently declined and is possibly smaller than Freplacement but larger than the F_{MSY} estimated in the 2000 assessment. Over the period 2001-2005 several abundance indicators suggest that the decline has been at least partially arrested, but some other indicators suggest that abundance has continued to

decline. Confirmation of these recent apparent changes in trend will require at least an additional four or five years of data, especially since the reliability of the recent information has diminished and may continue to do so.

WHITE MARLIN: No new information on stock status has been provided since the 2006 assessment. The recent biomass most likely remains well below the B_{MSY} estimated in the 2002 assessment. Current and provisional diagnoses suggest that F is probably smaller than F replacement and probably also larger than the F_{MSY} estimated in the 2002 assessment. Over the period 2001-2004 combined longline indices and some individual fleet indices suggest that the decline has been at least partially reversed, but some other individual fleet indices suggest that abundance has continued to decline. Confirmation of these recent apparent changes in trend will require at least an additional four or five years of data, especially since the reliability of the recent information has diminished and may continue to do so.

RECENT MANAGEMENT ADVICE: The ICCAT-SCRS in 2008 asked the Commission, at a minimum, to continue the management measures already in place because marlins have not yet recovered. The Commission should take steps to assure that the reliability of the recent fishery information improves in order to provide a basis for verifying possible future rebuilding of the stocks. Improvements are needed in the monitoring of the fate and amount of dead and live releases, with verification from scientific observer programs; verification of current and historical landings from some artisanal and industrial fleets; and complete and updated relative abundance indices from CPUE data for the major fleets. Should the Commission wish to increase the likelihood of success of the current management measures of the marlin rebuilding plan, further reduction in mortality would be needed, for example by:

- implementing plans to improve compliance of current regulations,
- encouraging the use of alternative gear configurations, including certain types of circle hooks, hook/bait combinations etc., in fisheries where its use has been shown to be beneficial,
- broader application of time/area catch restrictions.

Given the recent importance of the catch from artisanal fisheries, and to increase the likelihood of recovery of marlin stocks, the Commission should consider regulations that control or reduce the fishing mortality generated by these fisheries.

The Commission should encourage continued research on development of methods to incorporate this information into stock assessments in order to provide a basis for increasing the certainty with which management advice can be provided.

STECF COMMENTS: STECF agrees with the advice from ICCAT. Furthermore, STECF stresses the need for correct identification and reporting of billfish species in all EU fisheries in accordance with to the DCF. Furthermore, STECF notes that the 2008 ICCAT-SCRS report indicated the potential for the stocks of blue marlin and white marlin to recover to the B_{MSY} level. However, recent increases in catches of blue marlin by artisanal fisheries in both sides of the Atlantic may compromise the effectiveness of the ICCAT plan.

10.14. Sailfish, *Istiophorus platypteus*, Atlantic Ocean

FISHERIES: Sailfish has a pan-tropical distribution. ICCAT has established, based on life history information on migration rates and geographic distribution of catch, that there are two management units for Atlantic sailfish, eastern and western.

Sailfish are targeted by coastal artisanal and recreational fleets and, to a less extent, are caught as by-catch in longline and purse seine fisheries. Historically, catches of sailfish were reported together with spearfish by many longline fleets. In 2009 these catches were separated by the Working Group Historical catches of unclassified billfish continue to be reported to the Committee making the estimation of sailfish catch difficult. Catch reports from countries that have historically been known to land sailfish continue to suffer from gaps and there is increasing ad-hoc evidence of un-reported landings in some other countries. These considerations provide support to the idea that the historical catch of sailfish has been under-reported, especially in recent times where more and more fleets encounter sailfish as by-catch or target them.

Reports to ICCAT estimate that the Task I catch for 2008 was 1,274 t and 1,255 t, respectively, for the east and west region. Task I catches of sailfish for 2008 are preliminary because they do not include reports from all fleets.

The EU fleets reporting catches are EC-Spain (206 t in East Atlantic and 393 t in West Atlantic in 2008) and EC-Portugal (49 t in East Atlantic and 101 t in West Atlantic in 2008), while EC-United Kingdom and EC-France reports occasional catches in some years.

These species are primarily taken by longline fisheries (including various EU longline fisheries), but also by purse seines (including EU purse seiners catching a few hundred tonnes yearly), by some artisanal gears which are the only fisheries targeting marlins (Ghana, Cote d'Ivoire, including EU ones in the Antilles) and also by various sport fisheries located in both sides of the Atlantic. This group of species is becoming important in the Atlantic because of their charismatic status and the sport fisheries lobby (and because of the latter's active financial support to the ICCAT scientific researches on these species). The increasing use of anchored FADs by various artisanal and sport fisheries is increasing the vulnerability of these stocks.

SOURCE OF MANAGEMENT ADVICE: The advisory body is ICCAT.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: ICCAT recognizes the presence of two stocks of sailfish in the Atlantic, the eastern and western stocks. There is increasing evidence that an alternative stock structure with a north western stock and a south/eastern stock should be considered. Assessments of stocks based on the alternative stock structure option have not been undertaken to date, however, conducting them should be a priority for future assessments. In 2009 ICCAT conducted a full assessment of both Atlantic sailfish stocks through a range of production models and by using different combinations of relative abundance indices. It is clear that there remains considerable uncertainty regarding the stock status of these two stocks, however, many assessment model results present evidence of overfishing and evidence that the stocks are overfished, more so in the east than in the west. Although some of the results suggest a healthy stock in the west, few suggest the same for the east. The eastern stock is also assessed to be more productive than the western stock, and probably able to provide a greater MSY. The eastern stock is likely to be suffering stronger overfishing and most probably has been reduced further below the level that would produce the MSY than the western stock. Reference points obtained with other methods reach similar conclusions. Examination of recent trends in abundance suggests that both the eastern and western stocks suffered their greatest declines in abundance prior to 1990. Since 1990, trends in relative abundance conflict between different indices, with some indices suggesting declines, other increases and others not showing a trend. Examination of available length frequencies for a range of fleets show that average length and length distributions do not show clear trends during the period where there are observations.

Both the eastern and western stocks of sailfish may have been reduced to stock sizes below B_{MSY}. There is considerable uncertainty on the level of reduction, particularly for the west, as various production model fits indicated the biomass ratio $B2007/B_{MSY}$ both above and below 1.0. The results for the eastern stock were more pessimistic than those for the western stock in that more of the results indicated recent stock biomass below BMSY. Therefore there is particular concern over the outlook for the eastern stock.

RECENT MANAGEMENT ADVICE: The ICCAT-SCRS in 2009 recommends that catches for the eastern stock should be reduced from current levels. It should be noted, however, that artisanal fishermen harvest a large part of the sailfish catch along the African coast. The Committee recommends that catches of the western stock of sailfish should not exceed current levels. Any reduction in catch in the West Atlantic is likely to help stock re-growth and reduce the likelihood that the stock is overfished. It should be noted, however, that artisanal fishermen harvest a large part of the sailfish catch of the western sailfish stock.
The Committee is concerned about the incomplete reporting of sailfish catches, particularly for the most recent years, because it increases uncertainty in stock status determination. The Committee recommends all countries landing or having dead discards of sailfish, report these data to the ICCAT Secretariat.

STECF COMMENTS: STECF agrees with the advice from ICCAT, remarking the high uncertainty of the data and the assessment. Furthermore, STECF stresses the need for correct identification and reporting of billfish species in all EU fisheries in accordance with to the DCF.

10.15. Spearfish, Atlantic Ocean

FISHERIES: The generic common name Spearfish includes several species and, among them, at least *Tetrapturus angustirostris* (Shortbill spearfish, SSP), *Tetrapturus georgii* (Roundscale spearfish, RSP) and *Tetrapturus pfluegeri* (Longbill spearfish, SPF). The ICCAT/SCRS used Task I catches as the basis for the estimation of total removals. In recent years large catches of billfish continue to be reported as unclassified

billfish and reporting gaps remain for many important fleets. The last SCRS report does not mention any spearfish, amount is largely incomplete and, then, underestimated.

These species are primarily taken by longline fisheries (including various EU longline fisheries), but also by purse seines (including EU purse seiners), by some artisanal gears (including EU ones in the Antilles) and also by various sport fisheries located in both sides of the Atlantic. The increasing use of anchored FADs by various artisanal and sport fisheries is possibly increasing the vulnerability of these stocks.

SOURCE OF MANAGEMENT ADVICE: The advisory body is ICCAT.

PRECAUTIONARY REFERENCE POINTS: None.

STOCK STATUS: unknown.

RECENT MANAGEMENT ADVICE: None. In 2008, the SCRS recommended all countries landing or having dead discards of spearfish report these data by species to the ICCAT Secretariat.

STECF COMMENTS: STECF remarks that these species have been apparently forgotten in the last SCRS report and that data on catches in ICCAT Task I appear mixed-up among several species. STECF is concerned about the lack of attention about these species, because they might present the same problems of other billfish species. STECF recommends that all these species should be accurately monitored, particularly for the EU fleets within the EC data collection framework. In the absence of any official figure at least of the catch by species, STECF is not in the position to provide any management comment.

10.16. Mediterranean Spearfish (*Tetrapturus belone*)

FISHERIES: The Mediterranean fisheries catch mostly one species among sailfish and spearfish, the Mediterranean Spearfish (*Tetrapturus belone*), usually a by-catch in longline and driftnet fishery, but one of the target species for the traditional harpoon fishery and occasionally in sport fishing activity, also taking into account the high market price. Catches are unofficially known to occur in all the Mediterranean States where driftnet and longline fishing is carried out. The landings are largely unknown, although they seem to have increased in the most recent years, certainly over a level of about 100 t, even considering that only a very few Countries (Italy, Spain and Portugal) are reporting their catches to ICCAT. In 2005 and 2006 catches have shown fluctuation, while the geographic distribution of the species seems to be affected by the oceanographic situation. EC-Italy reported a total catch of 266 t in 2008, while data for most of the countries are mixed up among billfish species (BIL) in the ICCAT Task1 data . Other billfish and spearfish species are only very rarely present in most of the Mediterranean sea, but recent data show that catches could occur with a relative higher frequency in the western and central basins. No additional information is available.

SOURCE OF MANAGEMENT ADVICE: The advisory body is the ICCAT.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: No attempt has been made until now to analyse the status of the Mediterranean Spearfish, due to the lack of data from many fisheries.

RECENT MANAGEMENT ADVICE: ICCAT have not provided any kind of management recommendations for this stock.

STECF COMMENTS: While generally not a target species for commercial fleets, spearfish and billfish catches, including those from the recreational fishery, should be monitored carefully. Catches of Mediterranean spearfish must be reported by all MS concerned, also according to the EC Data collection framework.

10.17. Small tunas (Black skipjack, Frigate tuna, Atlantic bonito, Spotted Spanish mackerel, King mackerel and others), Atlantic and Mediterranean

FISHERIES: There are over fourteen species within the ICCAT category of small tunas, which includes Blackfin tuna -BLF (*Thunnus atlanticus*), Bullet tuna - BLT (*Auxis rochei*), Frigate tuna - FRI (*Auxis thazard*), Atlantic Bonito - BON (*Sarda sarda*), Plain bonito - BOP (*Orcynopsis unicolor*), Serra Spanish mackerel – BRS (*Scomberomorus brasiliensis*), Cero - CER (*Scomberomorus regalis*), King mackerel - KGM (*Scomberomorus cavalla*), Scomberomorus unclassified - KGX (*Scomberomorus* spp.), Little tunny - LTA (*Euthynnus alletteratus*), West African Spanish mackerel - MAW (*Scomberomorus tritor*), Atlantic Spanish mackerel - SSM (*Scomberomorus maculatus*), Narrow-barred Spanish mackerel - COM (*Scomberomorus commerson*) and Wahoo WAH (*Acanthocybium solandri*), plus some vagrant species which includes the Indian mackerel

(*Rastrelliger kanagurta*) and maybe also the Black skipjack – BKJ (*Euthynnus lineatus*) and Dogtooth tuna – DOT (*Gymnosarda unicolor*).Only five of these account for about 81% of the total catch by weight each year, according to the official statistics. In the '80s there was a marked increase in reported landings compared to previous years, reaching a peak of about 139,412 t in 1988. Reported landings for the 1989-1995 period decreased to approximately 92,637 t, and since then values have oscillated, with a minimum of 69,895 t in 1993 and a maximum of 123,600 t in 2005. Declared catches were 79,228 t in 2006 and 74,087 t in 2007. Overall trends in the small tuna catch may mask declining trends for individual species because annual landings are often dominated by the landings of a single species. These fluctuations seem to be partly related to unreported catches, as these species generally comprise part of the by-catch and are often discarded, and therefore do not reflect the real catch. A preliminary estimate of the total nominal landings of small tunas in 2008 is 55,876 t. The SCRS pointed out the relative importance of small tuna fisheries in the Mediterranean and the Black Sea, which account for 28% of the total reported catch in the 1980-2007. Several countries from the Mediterranean and Black Sea are not reporting catches to ICCAT. It is commonly believed that catches of small tunas are strongly affected by unreported or underreported data in all areas.

The 2008 preliminary catch amounted to 55,876 t, of which: 1,798 t of Blackfin tuna; 14,713 t of Bonito; 11,552 t of Little tunny; 35,26 t of Frigate tuna; 3,755 t of King mackerel; 5,900 t of Atlantic Spanish mackerel; 3,247 of Serra Spanish mackerel; 4,644 t of Wahoo, 6,018 t of Bullet tuna, 533 of Plain bonito, and 190 t of West-African Spanish mackerel.

Small tunas are exploited mainly by coastal fisheries and often by artisanal fisheries, although substantial catches are also made, either as target species or as by-catch, by purse-seiners, mid-water trawlers, handlines, troll lines, driftnets, surface drifting long-lines and small scale gillnets. Several recreational fisheries also target small tunas. Since 1991, the use of FADs by tropical purse-seiners may have led to an increase in fishing mortality of small tropical tuna species. The same fishing technique has been employed for a long time in the Mediterranean to catch dolphin fish (*Coryphaena hippurus*) but also small tunas; there are no statistics on these catches, even if it is known that the FAD fishery is now quite widespread in the Mediterranean according to the data provided to the ICCAT/GFCM joint expert working group in 2002. Data on the catch composition, biology and trends are now available from the Mediterranean and the Black Sea, thanks to the ICCAT/GFCM joint expert group in 2008. More information, particularly on specific fishing effort, is needed from all areas. The small tuna fishery seems to be quite important for the coastal communities, both economically and as a source of proteins.

SOURCE OF MANAGEMENT ADVICE: The advisory body is ICCAT, which operates also through the GFCM/ICCAT joint expert working group for the catches in the Mediterranean and the Black Sea.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for these stocks.

STOCK STATUS: There is little information available to determine the stock structure of many small tuna species. The SCRS suggests that countries be requested to submit all available data to ICCAT as soon as possible, in order to be used in future meetings. Assessments of stocks of small tunas are also important because of their position in the trophic chain, where they are the prey of large tunas, marlins and sharks and they are predators of smaller pelagic species. It may therefore be best to approach assessments of small tunas from the ecosystem perspective. Generally, current information does not allow the SCRS to carry out an assessment of stock status of the majority of the species. Some analyses will be possible in future if data availability improves with the same trend of the latest year. Nevertheless, few regional assessments have been carried out.

The King mackerel in the Gulf of Mexico and South Eastern United States Atlantic, and the Spanish mackerel in the South Eastern US were assessed in 2008. During the period 2004-2007, the CRFM undertook assessments of the Serra Spanish mackerel, King mackerel and Wahoo fisheries operating within the South-Eastern Caribbean. Further progress in the CRFM assessments requires improvements in statistics and estimation of key biological parameters, as well as close collaboration with neighbouring non-CRFM countries sharing these fisheries within the sub-region.

RECENT MANAGEMENT ADVICE: No management recommendations have been presented by ICCAT due to the lack of proper data, historical series and analyses. ICCAT/SCRS, in 2008, reiterated its recommendation to carry out studies to determine the state of these stocks and the adoption of management solutions, with some priority species for the West African area: Atlantic bonito, Little tunny, Bullet tuna and West African Spanish mackerel. However, the information available for the major part of the stocks suggests that the majority of the stocks can be managed at the regional or sub-regional level. GFCM/ICCAT had

identified some priority species, namely Bullet tuna, Atlantic bonito, Little tunny and Plain bonito. CRFM analyses of eastern Caribbean stocks have been limited by the quality and quantity of the available data, and in view of this, changes in current management approaches have not yet been recommended.

ICCAT-SCRS in 2009 noted that there is an improvement in the availability of catch and biological data for small tuna species particularly in the Mediterranean and the Black Sea. However, biological information, catch and effort statistics for small tunas remain incomplete for many of the coastal and industrial fishing countries. Given that, many of these species are of high importance to coastal fishermen, especially in some developing countries, both economically and often as a primary source of proteins, therefore the SCRS recommends that further studies be conducted on small tuna species due to the limits of information available.

STECF COMMENTS: STECF noted that several small tuna species have been included in the EC data collection framework and that this should possibly result in an improved availability of data in a few years, if properly implemented by the MS concerned. Independently from the small tuna species listed in the DCF, STECF recommends that fisheries and biological data be collected for all small tunas and not only those in the DCF.

10.18. Luvarus (*Luvarus imperialis*), Mediterranean Sea

FISHERIES: The Luvarus is usually a species not considered among the catches of the Mediterranean fisheries, but this poorly known species regularly occurred as a commercial by-catch in several driftnet fisheries, particularly between May and June, when this fishing activity was largely practiced. Catches may be significant in some periods; individuals of this species can exceed 80 kg. A minor by-catch occurs even in long-line fisheries but data are usually not reported. To date landings have not been never officially reported by any Country, although this species commands a high price on the market.

SOURCE OF MANAGEMENT ADVICE: The advisory body is FAO/GFCM.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: No attempt has been made until now to analyse the status of the Luvarus stock, due to the total lack of data. The ban on the use of driftnets by EC fleets since January 1st 2002 and from 2004 in all the ICCAT Mediterranean countries could results in a partially positive effect for the stock, even if illegal driftnet fishery is known to still occur in various areas.

RECENT MANAGEMENT ADVICE: GFCM have not provided any kind of management recommendations for this stock.

STECF COMMENTS: No comments.

10.19. Shortfin Mako (*Isurus oxyrinchus*), North Atlantic Ocean and Mediterranean.

FISHERIES: Shortfin mako sharks show a wide geographical distribution, most often between 50ºN (60°N in NE Atlantic) and 50ºS latitude, including the Mediterranean Sea.
The ICCAT-SCRS (2009) considered two separate stocks, one in the North Atlantic and one in the South Atlantic. According to the IUCN report in 2007, the shortfin mako in the Mediterranean is not considered as a sub-population and then, for the purpose of this report, it is considered as a part of the North Atlantic stock.
The shortfin mako in the North Atlantic is mostly taken by pelagic longlines, which account for more than 99% of the catches of this species reported to ICCAT in recent years. Catches in ICCAT Task I from North Atlantic range from 785 t in 1990 to a peak of 5,063 t in 2004 (but SCRS estimates about 7,000 t). Reported catches in 2007 are 3,915 t (but SCRS estimates a total of 5,996 t), while preliminary and incomplete catch reports in 2008 account 3,372 t. SCRS estimates were obtained during the 2008 assessment. EC fleets report the large majority of the catches: EC-Spain (1,895 t in 2008, equal to 48.4% of the total catch) and EC-Portugal (1,021 t in 2008), while occasional catches are reported by EC-United Kingdom,
In the Mediterranean Sea, this pelagic species is taken by a variety of fishing gears, always as by-catch, but it is rarely discarded as there is a market demand in the Mediterranean countries. Data on catches are extremely poor and largely incomplete, because many countries are not reporting them. On the basis of the most recent data reported by FAO-GFCM Capture Fisheries Production Dataset (Fishstat, 1970-2006) and ICCAT, landings for this species in the Mediterranean are only reported by Spain (1997-2006), Portugal (2001-2006) and Cyprus (2006-2007). The catches ranged from 2 to 8 tonnes in the period 1997-2003. A sharp increase occurred in 2004

(33 t) and 2005 (17 t) mostly due to the catches reported by Portugal. In 2006 official catches were reduced to 10 t, decreasing to 2 t in 2007. Preliminary and incomplete reported catches in 2008 account only to 1 t.

A number of standardized CPUE data series for shortfin mako were presented in 2008 as relative indices of abundance. The ICCAT/SCRSe placed emphasis on using the series that pertained to fisheries that operate in oceanic waters over wide areas.

SOURCE OF MANAGEMENT ADVICE: This species is under the ICCAT responsibility for the whole Convention area and for the catches obtained by the large pelagic fisheries. More general management advices can be provided by ICES and SAC-GFCM for all the other fisheries. IUCN also provides an advice on the conservation status.

PRECAUTIONARY REFERENCE POINTS: None.

STOCK STATUS: ICCAT- SCRS report in 2008 includes the assessment of the shoprtfin mako in the North Atlantic. For the North Atlantic, most model outcomes indicated stock depletion to about 50% of biomass estimated for the 1950s. Some model outcomes indicated that the stock biomass was near or below the biomass that would support MSY with current harvest levels above FMSY, whereas others estimated considerably lower levels of depletion and no overfishing. In light of the biological information that indicates the point at which BMSY is reached with respect of the carrying capacity which occurs at levels higher than for blue sharks and many teleost stocks. There is a non-negligible probability that the North Atlantic shortfin mako stock could be below the biomass that could support MSY. A similar conclusion was reached by the SCRS in 2004, and recent biological data show decreased productivity for this species.

The IUCN listed the shortfin mako as “Vulnerable” in 2007:

SCRS report in 2009 includes additional comments about the North Atlantic stock of shortfin mako. Ecological risk assessments (ERA) for eleven priority species of sharks (including shortfin mako) caught in ICCAT fisheries demonstrated that most Atlantic pelagic sharks have exceptionally limited biological productivity and, as such, can be overfished even at very low levels of fishing mortality. Specifically, the analyses indicated that shortfin makos (together with other two species) have the highest vulnerability (and lowest biological productivity) of the shark species examined. All species considered in the ERA are in need of improved biological data to evaluate their biological productivity more accurately and thus specific research projects should be supported to that end. ERAs should be updated with improved information on the productivity and susceptibility of these species.

In the Mediterranean catches are inadequately reported or non-recorded, so data collected for the Mediterranean were not considered sufficient to conduct quantitative assessments for this species. At the same time, SCRS did not include the very low catches from the Mediterranean in its 2008 assessment.

RECENT MANAGEMENT ADVICE: ICCAT SCRS in 2009 did not provided any specific management recommendation for this stock. In general, precautionary management measures should be considered for stocks where there is the greatest biological vulnerability and conservation concern, and for which there are very few data. For example, minimum landing lengths or maximum landing lengths would afford protection to juveniles or the breeding stock, respectively, although other technical measures such as gear modifications, time-area restrictions, or other approaches, could be alternative means to protecting different life stages, provided they are tested for effectiveness through research projects before they are implemented.

STECF COMMENTS: The shortfin mako shark is listed in the Barcelona Convention (App. III) and in the Bern Convention (App. III). It is also considered a high priority species for GFCM. Even if in the Mediterranean it is listed by the IUCN as “Critically Endangered”, the STECF Plenary 02-09 clarified that this status cannot be justified according to the IUCN criteria, because there is no knowledge of a separate sub-population. As a consequence, the IUCN status to be considered is “Vulnerable”, which covers the Atlantic and the Mediterranean areas.

Due to the poor data available, STECF recommends better reporting of the shortfin mako catches from all the fisheries and Member States involved, with the purpose to assess the state of the resource and the possible impacts due to the different fisheries.

10.20. Shortfin Mako (*Isurus oxyrinchus*), South Atlantic Ocean.

FISHERIES: Shortfin mako sharks show a wide geographical distribution, most often between 50ºN and 50ºS latitude. The shortfin mako in the South Atlantic is mostly taken by pelagic longlines, which account for about 99% of the catches of this species reported to ICCAT in recent years. Catches in ICCAT Task I from South Atlantic range from 262 t in 1987 to a peak of 3,426 t in 2003 (but SCRS estimates about 5,900 t in 2000). Reported catches in 2007 are 2,716 t (but SCRS estimates a total of about 4,600 t), while preliminary and incomplete catch reports in 2008 account 1,690 t. SCRS estimates were obtained during the 2008 assessment. EC fleets report the large majority of the catches: EC-Spain (628 t in 2008, equal to 37,2% of the total catch) and EC-Portugal (321 t in 2008), while occasional catches are reported by EC-United Kingdom,

SOURCE OF MANAGEMENT ADVICE: This species is under the ICCAT responsibility for the whole Convention area for the large pelagic fisheries. IUCN also provides an advice on the conservation status.

PRECAUTIONARY REFERENCE POINTS: None.

STOCK STATUS: Only one modeling approach could be applied to the South Atlantic shortfin mako stock, which resulted in an estimate of unfished biomass which was biologically implausible, and thus the Committee can draw no conclusions about the status of the South stock.

The IUCN listed the shortfin mako as "Vulnerable" in 2007:

RECENT MANAGEMENT ADVICE: ICCAT SCRS in 2009 did not provided any specific management recommendation for this stock. In general, precautionary management measures should be considered for stocks where there is the greatest biological vulnerability and conservation concern, and for which there are very few data. For example, minimum landing lengths or maximum landing lengths would afford protection to juveniles or the breeding stock, respectively, although other technical measures such as gear modifications, time-area restrictions, or other approaches, could be alternative means to protecting different life stages, provided they are tested for effectiveness through research projects before they are implemented.

STECF COMMENTS: Due to the poor data available, STECF recommends a better reporting of the shortfin mako catches from all the fisheries and Member States involved, with the purpose to assess the state of the stock and the possible impacts due to the different fisheries.

10.21. *Porbeagle* (*Lamna nasus*) in the North-East Atlantic

FISHERIES: Porbeagle is a highly migratory and schooling species. Sporadic targeted fisheries develop on these schools. Porbeagle fisheries are highly profitable. The main countries catching or having caught porbeagles are Spain and France. However in the past, important fisheries were prosecuted by Norway, Denmark and the Faeroe Islands. The only regular, target fishery that still exists is the French fishery. Several countries have sporadic fisheries taking porbeagles (which also takes occasional tope and blue sharks), in the North Sea, west of Ireland and Biscay, as they appear. These include Denmark, UK, and French vessels fishing to the south and west of England. Besides the pelagic fisheries, there is a by-catch by demersal trawlers from many countries, including Ireland, UK, France and Spain.

Existing EC management measures in the NE Atlantic include a TAC. Reported landings in 2008 were less than the TAC. A maximum landing length (210 cm fork length) was introduced in 2009 to deter fisheries targeting mature females.

According to the ICCAT catch table for the North Atlantic (including both NW and NE Atlantic), the portbeagle fishery ranged from a minimum of 470 t in 2006 to a maximum of 2,588 t in 1992. Recent catches for EU fleets are dominated by France (354 t in 2007 and 311 t in 2008), followed by Spain (8 t in 2007 and 41 t in 2008), Ireland (8 t in 2007 and 7 t in 2008) and Portugal (3 t in 2008), while Denmark, Germany, Netherlands and Sweden have only some occasional catch in the past. In the NE Atlantic there is a TAC of 436 t.

Given that catch reports to ICCAT are incomplete, the Committee attempted to develop a more accurate estimate of shark mortality and capture related to the Atlantic tuna fleets on the basis of the expected proportions among tunas and sharks and in the landings of these fleets as well as using shark fin trade data. These information sets were used to reconstruct plausible estimates of historic catches used in porbeagle assessment in 2009. According to this estimate, ICCAT considered that catches in NE Atlantic were in the order of 287 t in 2008.

SOURCE OF MANAGEMENT ADVICE: The main recent source of information and advice on porbeagle in the Northeast Atlantic is usually ICES. There is no fishery-independent information on this stock. Landings data for porbeagle may be reported as porbeagle, or as 'various sharks nei' in the official statistics. This means that the reported landings of porbeagle are likely an underestimation of the total landing of the species from the NE Atlantic. Recently, due to the relevance of large pelagic catches, the management advice was provided by ICCAT/SCRS, after a joint ICCAT/ICES assessment.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been agreed for porbeagle in the Northeast Atlantic.

STOCK STATUS: The ICCAT-ICES sub-group in 2009 considered that there is a single-stock of porbeagle in the NE Atlantic that occupies the entire ICES area (sub-areas I-XIV). This stock extends from the Barents Sea to northwest Africa. For management purposes the southern boundary of the stock is 36°N and the western boundary at 42°W. Given that porbeagle abundance in the central Atlantic appears to be small, ICCAT region BIL94b is a reasonable approximation of NE Atlantic porbeagle stock area. Historic tagging studies and recent satellite tagging studies indicate that few, if any, porbeagles make transatlantic crossings.

Available information from Norwegian and Faroese fisheries shows that landings declined strongly and these fisheries ceased in the ICES area. These fisheries have not resumed, implying that the stock has not recovered, at least in the areas where those fisheries took place. The available information from the French fishery suggests that CPUE reached a peak in 1994 and afterwards has declined. The CPUE has been stable at a much lower level since 1996. ICES WG in 2009 stated that there is no evidence of mixing between the NE Atlantic and the Mediterranean.

In 2009, the ICCAT-ICES assessed the Northeast stock (including the Mediterranean). The Northeast Atlantic stock has the longest history of commercial exploitation. A lack of CPUE data for the peak of the fishery adds considerable uncertainty in identifying the current status relative to virgin biomass. Exploratory assessments indicate that current biomass is below BMSY and that recent fishing mortality is near or above F_{MSY}. Recovery of this stock to B_{MSY} under no fishing mortality is estimated to take ca.15-34 years. The current EC TAC of 436 t in effect for the Northeast Atlantic may allow the stock to remain stable, at its current depleted biomass level, under most credible model scenarios. Catches close to the current TAC (e.g. 400 t) could allow rebuilding to B_{MSY} under some model scenarios, but with a high degree of uncertainty and on a time scale of 60 (40-124) years.

Porbeagle is subject to the UN agreement on highly Migratory Stocks and the UK Biodiversity priority list. In IUCN, porbeagle is now classified as Critically Endangered for the depleted unmanaged population in the northeast Atlantic off Europe.

RECENT MANAGEMENT ADVICE: ICES (2008) recommended that, given the state of the stock, no targeted fishing for porbeagle should be permitted and bycatch should be limited. Landings of porbeagle should not be allowed.

Porbeagles are particularly vulnerable to fishing mortality, because the population productivity is low (long-lived, slowgrowing, high age-at-maturity, low fecundity, and a protracted gestation period) and they have an aggregating behavior. In the light of this, risk of depletion of reproductive potential is high. It is recommended that exploitation of this species should only be allowed when indicators and reference points for stock status and future harvest have been identified and a management strategy, including appropriate monitoring requirements has been decided upon and is implemented.

ICCAT-SCRS (2009) recommended that precautionary management measures should be considered for stocks where there is the greatest biological vulnerability and conservation concern, and for which there are very few data. Management measures should ideally be species-specific whenever possible. For example, minimum landing lengths or maximum landing lengths would afford protection to juveniles or the breeding stock, respectively, although other technical measures such as gear modifications, time-area restrictions, or other approaches, could be alternative means to protecting different life stages, provided they are tested for effectiveness through research projects before they are implemented. Both porbeagle stocks in the NW and NE Atlantic are estimated to be overfished, with the northeastern stock being more depleted. The main source of fishing mortality on these stocks is from non-ICCAT, directed porbeagle fisheries that are being managed by most of the relevant Contracting Parties through quotas and other measures.

The ICCAT-SCRS recommended that countries initiate research projects to investigate means to minimize by-catch and discard mortality of sharks, with a particular view to recommending to the ICCAT complementary measures to minimize porbeagle by-catch in fisheries for tuna and tuna-like species.

For porbeagle sharks, the SCRS recommends that the ICCAT work with countries catching porbeagle, particularly those with targeted fisheries, and relevant RFMOs to ensure recovery of North Atlantic porbeagle stocks. In particular, porbeagle fishing mortality should be kept to levels in line with scientific advice and with catches not exceeding current level. New targeted porbeagle fisheries should be prevented, porbeagles retrieved alive should be released alive, and all catches should be reported. Management measures and data collection should be harmonized among all relevant RFMOs, and ICCAT should facilitate appropriate communication.

STECF COMMENTS: STECF agrees with the ICES advice that no targeted fishing for porbeagle should be permitted. STECF also agrees with ICES and SCRS/ICCAT that it should be a requirement for all countries to document all catches of this species, to better define the situation of this stock.

STECF notes that the minimal amount of catches reported in the Mediterranean does not affect the assessment of the NE Atlantic stock, therefore considers the assessment to be appropriate for the NE Atlantic stock. However, STECF remarks that the situation of the NE Atlantic stock is very confused as concerns the Mediterranean area, because the porbeagles in this latter geographic area are sometimes included or excluded in the NE Atlantic stocks assessments, while the IUCN classification is different in the two areas. In the absence of a clear scientific evidence to support one or the other hypothesis, STECF recommends that this issue should be analysed in detail by the RFMOs concerned or by a specific working group.

10.22. Porbeagle (*Lamna nasus*) in the North-West Atlantic

FISHERIES: Northwest Atlantic porbeagles are largely concentrated in the waters on and adjacent to the continental shelf of North America. Observer data from the Canadian, U.S., Spanish and Icelandic fleets indicate that porbeagles are found throughout the high seas of the North Atlantic north of 35°N, but that the CPUE on the high seas is relatively low. Conventional tagging data (~200 recaptures from three separate studies) indicate that NW Atlantic porbeagles are highly migratory within their stock area, but do not undertake trans-Atlantic migrations. More recent satellite tagging results reinforce this conclusion. Therefore the ICCAT sub-group concludes that there is a single stock of porbeagle in the NW Atlantic north of 35°N and west of 42°W, corresponding roughly to ICCAT region BIL94b and NAFO areas 0-6.

According to the ICCAT catch table for the North Atlantic (including both NW and NE Atlantic), the portbeagle fishery ranged from a minimum of 470 t in 2006 to a maximum of 2,588 t in 1992. The largest portion of the catches are obtained by surface longlines. Recent catches for EU fleets are dominated by France (354 t in 2007 and 311 t in 2008), followed by Spain (8 t in 2007 and 41 t in 2008), Ireland (8 t in 2007 and 7 t in 2008) and Portugal (3 t in 2008), while Denmark, Germany, Netherlands and Sweden have only some occasional catch in the past. Canada reports catches in the order of 124 t, all related to the NW Atlantic. There are two TAC established for the NW Atlantic porbeagle fishery: 185 t for the Canadian EEZ and 11.3 t for the USA.

Given that catch reports to ICCAT are incomplete, the Committee attempted to develop a more accurate estimate of shark mortality and capture related to the Atlantic tuna fleets on the basis of the expected proportions among tunas and sharks and in the landings of these fleets as well as using shark fin trade data. These information sets were used to reconstruct plausible estimates of historic catches used in porbeagle assessment in 2009. According to this estimate, ICCAT considered that catches in NW Atlantic were in the order of 144.3 t in 2008.

SOURCE OF MANAGEMENT ADVICE: The main recent source of information and advice on porbeagle in the Northwest Atlantic is usually ICES. There is no fishery-independent information on this stock, except for the tagging data. Landings data for porbeagle may be reported as porbeagle, or as 'various sharks nei' in the official statistics. This means that the reported landings of porbeagle are likely an underestimation of the total landing of the species from the NE Atlantic. Recently, due to the relevance of catches taken by tuna and tuna-like fisheries, the management advice was provided by ICCAT/SCRS, after a joint ICCAT/ICES assessment.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been agreed for porbeagle in the Northeast Atlantic.

STOCK STATUS:

In 2009, the ICCAT/SCRS updated the Canadian assessment of the Northwest Atlantic porbeagle stock. The results indicate that biomass is depleted to well below BMSY, but recent fishing mortality is below FMSY and recent biomass appears to be increasing. Additional modelling using a surplus production approach indicated a similar view of stock status, i.e., depletion to levels below B_{MSY} and current fishing mortality rates also below F_{MSY}. The Canadian assessment projected that with no fishing mortality, the stock could rebuild to B_{MSY} level in approximately 20-60 years, whereas surplus-production based projections indicated 20 years would suffice. Under the Canadian strategy of a 4% exploitation rate, the stock is expected to recover in 30 to 100+ years according to the Canadian projections.

Porbeagle is subject to the UN agreement on highly Migratory Stocks. In IUCN (2004), porbeagle is classified as Endangered for the North West Atlantic.

RECENT MANAGEMENT ADVICE: ICCAT-ICES recommended that the ICCAT should adopt management measures that support the recovery objectives of the Canadian Management Plan. High-seas fisheries should not target porbeagle and all by-catch should be reported. Due to their lower abundance in the high seas, by-catch data collection and reporting would require scientific observer sampling at a high level of coverage.

Areas known to have high abundance of important life-history stages (e.g. mating, pupping and nursery grounds) should be subject to fishing restrictions. Such grounds are not exclusively in the Canadian EEZ. Increased effort on the high seas within the stock area could compromise stock recovery efforts.

ICCAT-SCRS recommended that precautionary management measures should be considered for stocks where there is the greatest biological vulnerability and conservation concern, and for which there are very few data. Management measures should ideally be species-specific whenever possible. For example, minimum landing lengths or maximum landing lengths would afford protection to juveniles or the breeding stock, respectively, although other technical measures such as gear modifications, time-area restrictions, or other approaches, could be alternative means to protecting different life stages, provided they are tested for effectiveness through research projects before they are implemented.

Both porbeagle stocks in the NW and NE Atlantic are estimated to be overfished. The main source of fishing mortality on these stocks is from non-ICCAT, directed porbeagle fisheries that are being managed by most of the relevant Contracting Parties through quotas and other measures. The ICCAT-SCRS recommended that countries initiate research projects to investigate means to minimize by-catch and discard mortality of sharks, with a particular view to recommending to the ICCAT complementary measures to minimize porbeagle by-catch in fisheries for tuna and tuna-like species. For porbeagle sharks, the SCRS recommends that the ICCAT work with countries catching porbeagle, particularly those with targeted fisheries, and relevant RFMOs to ensure recovery of North Atlantic porbeagle stocks. In particular, porbeagle fishing mortality should be kept to levels in line with scientific advice and with catches not exceeding current level. New targeted porbeagle fisheries should be prevented, porbeagles retrieved alive should be released alive, and all catches should be reported. Management measures and data collection should be harmonized among all relevant RFMOs, and ICCAT should facilitate appropriate communication.

STECF COMMENTS: STECF notes that management advices provided by ICCAT/ICES and by ICCAT/SCRS are partly different. STECF agrees with the specific measures indicated by ICCAT/ICES and underline the requirement for all countries to document all incidental by-catches of this species.

10.23. Porbeagle (*Lamna nasus*) in the South-West Atlantic

FISHERIES: Like in other areas, this pelagic species is sometimes caught by several fishing gears as by-catch, but it is usually retained on board and sold on the market for its good price. The high commercial value (in target and incidental fisheries) of mature and immature age classes makes this species highly vulnerable to over-exploitation and population depletion.

According to the ICCAT catch table for the South Atlantic (including both SW and SE Atlantic), the portbeagle fishery ranged from a minimum of 0 t in many years to a maximum of 91 t in 2008. The largest portion of the catches are obtained by surface longlines. Recent catches for EU fleets are dominated by Spain (5 t in 2007 and 4 t in 2008), while Bulgaria, Netherlands, Poland and Portugal have only some occasional catch in the past. The major catches are reported by Japan (47 t in 2008) and Uruguay (40 t in 2008), the latter certainly attributed to the SW Atlantic area.

Given that catch reports to ICCAT are incomplete, the Committee attempted to develop a more accurate estimate of shark mortality and capture related to the Atlantic tuna fleets on the basis of the expected proportions among tunas and sharks and in the landings of these fleets as well as using shark fin trade data. These information sets were used to reconstruct plausible estimates of historic catches used in porbeagle assessment in 2009. According to this estimate, ICCAT considered that catches in SW Atlantic were in the order of 164.6 t in 2008.

SOURCE OF MANAGEMENT ADVICE: The advisory body is ICCAT, but this species is also under the responsibility of other RFMOs managing different fisheries.

PRECAUTIONARY REFERENCE POINTS: None.

STOCK STATUS: The ICCAT-ICES subgroup in 2009 considered the distribution of the porbeagle stock in the SW Atlantic, south of 25°S and west of 20°W. It was suggested that it could apparently comprise waters of the southeast Pacific Ocean but more robust data are required to confirm this fact which would have direct implications on the management of this stock.

ICCAT/SCRS in 2009 stated that, in general, data for southern hemisphere porbeagle are too limited to provide a robust indication on the status of the stocks. For the Southwest stock, limited data indicate a decline in CPUE in the Uruguayan fleet, with models suggesting a potential decline in porbeagle abundance to levels below MSY and fishing mortality rates above those producing MSY. But catch and other data are generally too limited to allow definition of sustainable harvest levels. Catch reconstruction indicates that reported landings grossly underestimate actual landings.

RECENT MANAGEMENT ADVICE: For porbeagle sharks, the ICCAT/SCRS recommended that the ICCAT work with countries catching porbeagle, particularly those with targeted fisheries, and relevant RFMOs to prevent overexploitation of South Atlantic stocks. In particular, porbeagle fishing mortality should be kept to levels in line with scientific advice and with catches not exceeding current level. New targeted porbeagle fisheries should be prevented, porbeagles retrieved alive should be released alive, and all catches should be reported.

STECF COMMENTS: STECF recommends a better reporting of the porbeagle catches from all the fisheries and Member States involved in the SW Atlantic area, with the purpose to provide a reliable assessment of the state of the resource and the possible impacts due to the different fisheries concerned.

10.24. Porbeagle (*Lamna nasus*) in South-East Atlantic

FISHERIES: This pelagic species is sometimes caught by several fishing gears as by-catch, but it is usually retained on board and sold on the market for its good price. Target fisheries were also reported since decades. The high commercial value (in target and incidental fisheries) of mature and immature age classes makes this species highly vulnerable to over-exploitation and population depletion.

According to the ICCAT catch table for the South Atlantic (including both SW and SE Atlantic), the portbeagle fishery ranged from a minimum of 0 t in many years to a maximum of 91 t in 2008. The largest portion of the catches are obtained by surface longlines. Recent catches for EU fleets are dominated by Spain (5 t in 2007 and 4 t in 2008), while Bulgaria, Netherlands, Poland and Portugal have only some occasional catch in the past. The major catches are reported by Japan (47 t in 2008) and Uruguay (40 t in 2008), the latter certainly non attributed to the SE Atlantic area.

SOURCE OF MANAGEMENT ADVICE: The advisory body is ICCAT, but this species is also under the responsibility of other RFMOs managing different fisheries.

PRECAUTIONARY REFERENCE POINTS: None.

STOCK STATUS: The ICCAT-ICES sub-group in 2009 considered the distribution of the porbeagle stock in the SE Atlantic, south of 25°S and east of 20°W. It was suggested that it could apparently comprise waters of the southwest Indian Ocean but more robust data are required to confirm this fact which would have direct implications on the management of this stock. There is belief that catches made in the southwestern Indian Ocean impact the SE Atlantic porbeagle stock which should be taken into consideration into future assessments.

Neither the ICCAT/ICES sub-group in 2009 nor the ICCAT/SCRS 2009 provided any assessment for this stock, possibly because of the lack of sufficient data and information.

RECENT MANAGEMENT ADVICE: The ICCAT/SCRS 2009 recommended that the ICCAT work with countries catching porbeagle, particularly those with targeted fisheries, and relevant RFMOs to prevent overexploitation of South Atlantic stocks.

STECF COMMENTS: STECF recommends a better reporting of the porbeagle catches from all the fisheries and Member States involved, with the purpose to assess the state of the resource and the possible impacts due to the different fisheries.

10.25. Porbeagle (*Lamna nasus*) in the Mediterranean Sea

FISHERIES: This pelagic species is sometimes caught by some fishing gears as by-catch, but it is usually retained on board and sold on the market for its good price. The high commercial value (in target and incidental fisheries) of mature and immature age classes makes this species highly vulnerable to over-exploitation and population depletion. Finning is not usually carried ou in the Mediterranean.

Data on catches are extremely poor. On the basis of the most recent data reported by FAO-GFCM Capture Fisheries Production Dataset (Fishstat, 1970-2008) and ICCAT, landings of this species in the Mediterranean are only reported by Albania, Spain, Italy and Malta. The total yearly landings were very low, amounting to around 1 t with a peak of 4 tonnes in 2006. Reported catches in 2008 account only 2 t. However, even if the total quantity possibly taken annually is low, these catches appear to be underestimated due to the misreporting or not-reporting by some States.

SOURCE OF MANAGEMENT ADVICE: The advisory body is SAC-GFCM, but this species is also under the ICCAT responsibility.

PRECAUTIONARY REFERENCE POINTS: None.

STOCK STATUS: The Mediterranean was considered as a separate management unit for this species for a number of years, even in the absence of a precise identification of the stock. IUCN (2007) considered the porbeagle in the Mediterranean as a sub-population and the ICES WG in 2009 stated that there is no evidence of mixing between the NE Atlantic and the Mediterranean.

In 2009, the very recent ICCAT/SCRS attempted an assessment of the Northeast Atlantic porbeagle stock, including the Mediterranean.

The porbeagle shark is considered globally as a Vulnerable species and the IUCN (2007) had confirmed this status for the Mediterranean sub-population. In 2009, the UNEP/MAP had proposed to assess the Mediterranan porbeagle as “Critically Endangered” (CR A2bd). The porbeagle shark in the Mediterranean is listed in the Barcelona Convention (App. III) and in the Bern Convention (App. III).

RECENT MANAGEMENT ADVICE: The ICCAT/SCRS 2009 recommended that the ICCAT work with countries catching porbeagle and relevant RFMOs to prevent overexploitation of porbeagle stocks.

STECF COMMENTS: STECF, in line with its Plenary 09-02 report, recommend that stock or sub-populations should be properly documented on scientific basis before including or excluding them in any specific assessment. For this reason, STECF remarks that the uncertainties created by IUCN, UNEP, ICES and ICCAT about the existence of a discrete Mediterranean stock of porbeagle need to be analysed and clarified if sufficient scientific information is available. Nevertheless, STECF recommends a better reporting of the porbeagle catches from all the fisheries and Member States involved, taking into account that this is a mandatory species within the EC data collection framework.

10.26. Blue shark (*Prionace glauca*) in the North Atlantic

FISHERIES: This species, having a wide distribution, is caught by several gears, but most of the catches are reported by pelagic longlines. It is a major by-catch and accessory species of European large pelagic fisheries. Blue shark accounts for more than 90% of all sharks caught by pelagic longlines. A number of standardized CPUE data series for blue shark were presented to ICCAT/SCRS in 2008 as relative indices of abundance.

Data on catches are partly or under-reported, particularly for some fleets. Historical catches range from 121 t in 1984 to 30,545 t in 2008. The major catches are reported by EC-Spain, with 20,788 t in 2008 (17,038 t in 2007), usually accounting for more than 60% of the total North Atlantic catches. Relevant catches are reported also by EC-Portugal with 6,167 t in 2008 (5283 t in 2007) and Japan with 1,921 in 2008 (2,696 t in 2007). Minor or

occasional catches are also reported by several EC countries as France, Denmark, Ireland, Netherlands and United Kingdom.

Given that catch reports to ICCAT are incomplete, the Committee attempted to develop a more accurate estimate of shark mortality and capture related to the Atlantic tuna fleets on the basis of the expected proportions among tunas and sharks and in the landings of these fleets as well as using shark fin trade data. These information sets were used to reconstruct plausible estimates of historic catches used in blue shark assessment in 2009. According to this estimate, ICCAT considered that catches in North Atlantic were in the order of 61,845 t in 2008.

SOURCE OF MANAGEMENT ADVICE: The advisory body is ICCAT, but data on this species is also possibly collected by other RFMOs.

PRECAUTIONARY REFERENCE POINTS: None.

STOCK STATUS: Blue shark shows a wide geographical distribution, most often between 50ºN and 50ºS latitude. A characteristic of this species is usually their tendency to segregate temporally and spatially by size-sex, according to its respective processes of feeding, mating-reproduction, gestation and birth. Numerous aspects of the biology of this species are still poorly understood or completely unknown, particularly for some regions, which contributes to increased uncertainty in quantitative and qualitative assessments.

ICCAT/SCRS (2009) reported that ecological risk assessments for eleven priority species of sharks (including blue shark) caught in ICCAT fisheries demonstrated that most Atlantic pelagic sharks have exceptionally limited biological productivity and, as such, can be overfished even at very low levels of fishing mortality. All species considered in the ERA are in need of improved biological data to evaluate their biological productivity more accurately and thus specific research projects should be supported to that end.

For both North and South Atlantic blue shark stocks, although the results are highly uncertain, biomass is believed to be above the biomass that would support MSY and current harvest levels below FMSY. Results from all models used in the 2008 assessment were conditional on the assumptions made (*e.g.*, estimates of historical catches and effort, the relationship between catch rates and abundance, the initial state of the stock in the 1950s,and various life-history parameters), and a full evaluation of the sensitivity of results to these assumptions was not possible during the assessment. Nonetheless, as for the 2004 stock assessment, the weight of available evidence does not support hypotheses that fishing has yet resulted in depletion to levels below the Convention objective.

The blue shark is subject to the UN agreement on highly Migratory Stocks. In IUCN (2007), the blue shark is classified as Near Threatened globally.

RECENT MANAGEMENT ADVICE: No specific management advice was provided by ICCAT/SCRS in 2009. Precautionary management measures should be considered for stocks where there is the greatest biological vulnerability and conservation concern, and for which there are very few data. Management measures should ideally be species-specific whenever possible.

STECF COMMENTS: STECF again recommends improving the data collection on the blue shark from all the fisheries and Member States involved, with the purpose of assessing the status of this stock. STECF notes that this species is a mandatory one in the EC Data collection framework.

10.27. Blue shark (*Prionace glauca*) in South Atlantic

FISHERIES: This species, having a wide distribution, is caught by several gears, but most of the catches are reported by pelagic longlines. It is a major by-catch and accessory species of European large pelagic fisheries. Blue shark accounts for more than 90% of all sharks caught by pelagic longlines. A number of standardized CPUE data series for blue shark were presented to ICCAT/SCRS in 2008 as relative indices of abundance.

Data on catches are partly or under-report with many countries non-reporting any catch. Historical catches range from 0 t in the ‘80s to 23,278 t in 2008. The major catches are reported by EC-Spain, with 8,942 t in 2008 (9,615 t in 2007), usually accounting for about 40% of the total South Atlantic catches. Relevant catches are reported also by EC-Portugal with 4,866 t in 2008 (4,493 t in 2007), Brazil with 1,986 t in 2008 (2,258 t in 2007), Namibia with 1,829 t in 2008 (no catches reported in 2007) and Japan with 1,945 t in 2008 (896 t in 2007). Minor or occasional catches are also reported by a few EC countries as Netherlands and United Kingdom.

Given that catch reports to ICCAT are incomplete, the Committee attempted to develop a more accurate estimate of shark mortality and capture related to the Atlantic tuna fleets on the basis of the expected proportions among tunas and sharks and in the landings of these fleets as well as using shark fin trade data. These information sets were used to reconstruct plausible estimates of historic catches used in blue shark assessment in 2009. According to this estimate, ICCAT considered that catches in South Atlantic were in the order of 37,075 t in 2008.

SOURCE OF MANAGEMENT ADVICE: The advisory body is ICCAT, but data on this species is also possibly collected by other RFMOs.

PRECAUTIONARY REFERENCE POINTS: None.

STOCK STATUS: Blue shark shows a wide geographical distribution, most often between 50ºN and 50ºS latitude. A characteristic of this species is usually their tendency to segregate temporally and spatially by size-sex, according to its respective processes of feeding, mating-reproduction, gestation and birth. Numerous aspects of the biology of this species are still poorly understood or completely unknown, particularly for some regions, which contributes to increased uncertainty in quantitative and qualitative assessments.

ICCAT/SCRS (2009) reported that ecological risk assessments for eleven priority species of sharks (including blue shark) caught in ICCAT fisheries demonstrated that most Atlantic pelagic sharks have exceptionally limited biological productivity and, as such, can be overfished even at very low levels of fishing mortality. All species considered in the ERA are in need of improved biological data to evaluate their biological productivity more accurately and thus specific research projects should be supported to that end.

For both North and South Atlantic blue shark stocks, although the results are highly uncertain, biomass is believed to be above the biomass that would support MSY and current harvest levels below FMSY. Results from all models used in the 2008 assessment were conditional on the assumptions made (*e.g.*, estimates of historical catches and effort, the relationship between catch rates and abundance, the initial state of the stock in the 1950s,and various life-history parameters), and a full evaluation of the sensitivity of results to these assumptions was not possible during the assessment. Nonetheless, as for the 2004 stock assessment, the weight of available evidence does not support hypotheses that fishing has yet resulted in depletion to levels below the Convention objective.

The blue shark is subject to the UN agreement on highly Migratory Stocks. In IUCN (2007), the blue shark is classified as Near Threatened globally.

RECENT MANAGEMENT ADVICE: No specific management advice was provided by ICCAT/SCRS in 2009. Precautionary management measures should be considered for stocks where there is the greatest biological vulnerability and conservation concern, and for which there are very few data. Management measures should ideally be species-specific whenever possible.

STECF COMMENTS: STECF again recommends improving the data collection on the blue shark from all the fisheries and Member States involved, with the purpose of assessing the status of this stock. STECF notes that this species is a mandatory one in the EC Data collection framework.

10.28. Blue shark (*Prionace glauca*) in the Mediterranean Sea

FISHERIES: This pelagic species (BSH) is often caught by several fishing gears, always as by-catch and sometimes marketed. Catches mainly come from large pelagic long-line fisheries targeting tuna fish and swordfish and small driftnet fisheries. It is a major by-catch and accessory species of European large pelagic fisheries. Blue shark accounts for almost 95% of all sharks caught by drifting longlines. A number of specimens may be also taken in large driftnet fisheries; (these nets have been banned since January 1, 2002 for the EU fleets and since 2004 in all the Mediterranean according to ICCAT and GFCM Recommendations). The driftnet fishery in the Alboran Sea by Moroccan vessels is reported catching large numbers of blue sharks (estimated at more than 26,000 individuals per year). Recently this species has increased in commercial value and incidental catches are now very rarely discarded in several areas, with the meat marketed in Greece, Italy (in some regions), Spain and in north-African countries and fins sometimes exported to Asia.

Data on catches exist but they are very partial and many countries are not reporting their catches (including Morocco). On the basis of the most recent data reported to ICCAT, landings for this species are reported by Spain, France, Cyprus, Italy, Malta, Japan and Portugal. The yearly landings ranged from 0 to 178 t in the

period 1984-2008. In 2006, reported catches reached the historical maximum of 178 t. Reported catches are 51 t in 2007 and 80 t in 2008. The high catch is reported by EC-Italy, with 75 t in 2008 (46 t in 2007), followed by EC-Spain with 2 t and Malta with 2 t, while catches have been reported in the past also by EC-Portugal and EC-Cyprus.

SOURCE OF MANAGEMENT ADVICE: The advisory body is ICCAT, but this species is also under the GFCM responsibility.

PRECAUTIONARY REFERENCE POINTS: None.

STOCK STATUS: The Mediterranean is considered to host a separate stock of blue shark and should be managed as a separate unit.

The blue shark is listed in the Barcelona Convention (Appendix III) and in the Bern Convention (Appendix III). In the Mediterranean it is listed as vulnerable (A3bd + 4bd), while the global population is listed as LR/nt (Lower Risk, near threatened) in the IUCN Red List.

RECENT MANAGEMENT ADVICE: Data must be collected in the ICCAT area.

STECF COMMENTS: STECF again recommends improving the data collection on the blue shark from all the fisheries and Member States concerned, with the purpose of assessing the status of this stock. STECF notes that this species is a mandatory one in the EC Data collection framework but the understanding of this stock cannot improve if non-EC countries will continue in non-reporting their catches to ICCAT or GFCM.

10.29. Thresher shark (*Alopias vulpinus*) in the Atlantic Ocean and the Mediterranean

FISHERIES: This pelagic species is sometimes caught by several fishing gears, always as by-catch, but it is often retained on board and sold on the market for its good price. In the Northern Adriatic Sea, in the Mediterranean, gillnets (often set for demersal species) also have a by-catch of *Alopias vulpinus* particularly in the summer. This species may be also taken in large driftnet fisheries, even though this fishery is prohibited in the Mediterranean since years. Surface long-line fisheries, that target tuna and tuna-like species in the Atlantic Ocean and the Mediterranean, also catch *A. vulpinus*.

Data on catches are extremely poor and are suspected to include other species belonging to the same genus.

Data on catches are largely not reported or under-reported, with several countries never reporting them. According to the ICCAT data base (ALV), catches ranged from a minimum of 2 t in 1993 to a maximum of 158 t in 2000, with 70 t reported in 2008. In 2008 the highest catch was reported by EC-Portugal with 53 t (98 t in 2007), while very minor catches were reported by a number of countries. Landings for this species in the Mediterranean are reported by Spain (1997-2006), Portugal (2001-2006), Italy and France (1999-2006), ranging from 3 to 21 t in the period 1996-2006.

Reported catches of unclassified thresher shark (*Alopias* spp., THR) ranged from a minimum of 6 t in 1986 to a maximum of 189 t in 1987, with 134 t reported in 2008. In 2008 the highest catch was reported by EC-Spain with 81 t, followed by USA with 48 t. Minor or occasional catches were historically reported also by other EC countries (Ireland, Portugal and United Kingdom).

SOURCE OF MANAGEMENT ADVICE: The advisory bodies are ICCAT (for the tuna and tuna-like fisheries) and all the relevant RFMOs (for all the other fisheries).

PRECAUTIONARY REFERENCE POINTS: None

STOCK STATUS: There is no mention of separate populations of this species, even if some WGs had considered the specimens living in the Mediterranean as a separate unit in the past. There is no assessment of the Atlantic and Mediterranean stock available, while conservation assessments have been conducted by IUCN in 2003 and 2007, defining this species as globally "Vulnerable", besides the lack of catch data, incomplete knowledge of stock structure, and uncertainty over life history parameters which make it impossible to determine population size and fluctuations.

RECENT MANAGEMENT ADVICE: None.

STECF COMMENTS: STECF recommends a better reporting of the Thresher shark catches from all the fisheries and Member States involved, with the purpose of better understanding the current state of the stock.

10.30. Bigeye thresher shark (*Alopias superciliosus*) in the Atlantic Ocean and the Mediterranean

FISHERIES: This pelagic species (BTH) is sometimes caught by several fishing gears, always as by-catch, but it is often retained on board and sold on the market for its good price. This species might be confused in the catch statistics with other thresher sharks.

Data on catches are extremely poor. According to the ICCAT data base, catches ranged from a minimum of 6 t in 1986 to a maximum of 189 t in 1987, with 134 t reported in 2008. The highest catch in 2008 was reported by EC-Spain with 81 t, followed by USA with 48 t, while very minor catches were reported by a some of countries, including EC-Ireland, EC-Portugal and EC-United Kingdom.

SOURCE OF MANAGEMENT ADVICE: The advisory bodies are ICCAT (for the tuna and tuna-like fisheries) and all the relevant RFMOs (for all the other fisheries).

PRECAUTIONARY REFERENCE POINTS: None

STOCK STATUS: There is no evidence of separate populations of this species, There is no assessment of the Atlantic and Mediterranean stock available, while a conservation assessments was conducted by IUCN in 2007, defining this species as globally "Vulnerable", besides the lack of catch data, incomplete knowledge of stock structure, and uncertainty over life history parameters which make it impossible to determine population size and fluctuations.

RECENT MANAGEMENT ADVICE: ICCAT Rec. 08-07 recommends CPCs shall require vessels flying their flag to promptly release unharmed, to the extent practicable, bigeye thresher sharks (*Alopias superciliosus)* caught in association with fisheries managed by ICCAT which are alive, when brought along side for taking on board the vessel. CPCs shall also require that incidental catches as well as live releases shall be recorded in accordance with ICCAT data reporting requirements.

STECF COMMENTS: STECF agrees with the ICCAT recommendation and recommends a better reporting of the bigeye thresher shark catches from all the fisheries and Member States concerned, with the purpose of better understanding the current state of the stock.

10.31. Smooth hammerhead (*Sphyrna zygaena*) in the Atlantic Ocean and the Mediterranean Sea

FISHERIES: The Smooth hammerhead (SPZ) is a relatively common and widespread shark, captured in a number of fisheries throughout its range, mostly by gillnet and pelagic long-line. There might be a significant mortality of this species in large-scale long-line and driftnet fisheries, although the impact on populations is unknown at present.

Data on catches are considered scarce, suspected to include other species belonging to the same genus and they are largely not reported or under-reported, with several countries never reporting them. According to the ICCAT data base, catches ranged from a minimum of 1 t in 1995 to a maximum of 1,472 t in 2002, with 109 t reported in 2008. The highest catch in 2008 was reported by Senegal (103 t), followed by Ivory Coast (which usually reports catches in the order of 40 t) and EC-Portugal (6 t), while very minor catches were historically reported by a number of countries, including EC-Spain, EC-Italy and EC-Malta.

SOURCE OF MANAGEMENT ADVICE: The advisory bodies are ICCAT (for the tuna and tuna-like fisheries) and all the relevant RFMOs (for all the other fisheries).

PRECAUTIONARY REFERENCE POINTS: None

STOCK STATUS: There is no evidence of separate populations of this species, There is no assessment of the Atlantic and Mediterranean stock available, while a conservation assessments was conducted by IUCN in 2008, defining this species as globally "Vulnerable"; IUCN (2007) and UNEP/SPA (2008) had proposed a separate evaluation of this species in the Mediterranean, even in the absence of any evidence of a separate sub-population.

RECENT MANAGEMENT ADVICE: None. UNEP/SPA in 2008 proposed the inclusion of this species in the Annex II of the SPA/BD protocol of the Barcelona Convention.

STECF COMMENTS: STECF reiterates the concerns about the different classification of conservation status in various areas in the absence of any evidence of sub-populations, raised during the STECF Plenary 09-02. STECF recommends the collection of catch data and basic information on this species by the EU Member States to better understand the current situation of the stock.

10.32. Other Hammerhead sharks (Sphyrnidae) in the Atlantic Ocean and the Mediterranean Sea

FISHERIES: The hammerhead sharks are widespread species, captured in a number of fisheries throughout its range, mostly by gillnet and pelagic long-line. There might be a significant mortality of these species in large-scale long-line and driftnet fisheries, although the impact on populations is unknown at present.

Data on catches are considered scarce, not well defined by species, and they are largely not reported or under-reported, with several countries never reporting them. According to the ICCAT database, catches by species or category are the followings:

Sphyrna lewini (SPL): reported catches ranged from a minimum of 0 t in 2006/2007 to a maximum of 363 t in 1990, with only 1 t reported in 2008 by Venezuela. Historically, catches were reported also by EC-Spain.

Sphyrna tiburo (SPJ): reported catches are available only in 2004 with 77 t reported by USA.

Sphyrna mokarran (SPK): reported catches ranged from a minimum of 0 t in 2004 to a maximum of 19 t in 1992, with only 1 t reported in 2008 by St. Lucia. Historically, catches were reported also by EC-Spain.

Sphyrna spp. (SPN): reported catches ranged from a minimum of 0 t in 1992 to a maximum of 883 t in 1987, with 251 t reported in 2008 (incomplete report). The highest catch in 2008 was reported by Brazil (122 t), followed by USA (56 t), EC-Portugal (27 t) and Namibia (25 t), but EC-Spain, which usually accounts for about 50 to 70% of the catches, did not reported any catch till the recent ICCAT/SCRS 2009 meeting.

Sphyrnidae (SPY): reported catches ranged from a minimum of 47 t in 2004 to a maximum of 198 t in 2008. The highest catch in 2008 was reported by EC-Spain (198 t); Uruguay usually reports catches of these undefined sharks.

Catches of these species in the Mediterranean area are incidental.

SOURCE OF MANAGEMENT ADVICE: The advisory bodies are ICCAT (for the tuna and tuna-like fisheries) and all the relevant RFMOs (for all the other fisheries).

PRECAUTIONARY REFERENCE POINTS: None

STOCK STATUS: There is no evidence of separate populations of these species. There is no assessment of the Atlantic and Mediterranean stocks available, while a conservation assessments was conducted by IUCN in 2008, defining *Sphyrna lewini* and *Sphyrna mokarran* as globally "Endangered

RECENT MANAGEMENT ADVICE: None. UNEP/SPA in 2008 proposed the inclusion of *Sphyrna mokarran* and *Sphyrna lewini* in the Annex II of the SPA/BD protocol of the Barcelona Convention for the Mediterranean.

STECF COMMENTS: STECF reiterates the concerns about the different classification of IUCN status in various areas in the absence of any evidence of sub-populations, raised during the STECF Plenary 09-02. STECF recommends the collection of catch data and basic information on these species (possibly with a precise identification) by the EU Member States to better understand the current situation of the stocks.

10.33. *Carcharhinus* spp.

FISHERIES: This important group of pelagic species includes at least 17 species in the Atlantic Ocean, while only 8 of them are reported in the Mediterranean Sea, Among those, the ICCAT data base reports catches concerning 14 species in the various areas. These species are often caught as by-catch in surface long-line fisheries targeting tuna and tuna-like species. A number of specimens may also be caught by large driftnet fisheries, even though this fishery is prohibited since years. In some countries there is also a target fishery for some species.

The landings reported to ICCAT are the followings:

Species	code	name	Min catch	Max catch	Latest catch
Carcharhinus plumbeus	CCP	Sandbar shark	<1 t (1990)	468 t (1996)	12 t (2008)
Carcharhinus limbatus	CCL	Blacktip shark	7 t (1990)	565 t (2005)	62 t (2008)
Carcharhinus melapterus	BLR	Blacktip reef shark		<1 t (2007)	<1 t (2007)
Carcharhinus acronotus	CCN	Blacknose shark		49 t (2004)	49 t (2004)
Carcharhinus longimanus	OCS	Oceanic whitetip shark	<1 t (1990)	642 t (2000)	246 t (2008)
Carcharhinus porosus	CCR	Smalltail shark	10 t (2006)	306 (2002)	10 t (2006)
Carcharhinus obscurus	DUS	Dusky shark	<1 t (2003/4)	270 t (1994)	2 t (2008)
Carcharhinus falciformis	FAL	Silky shark	7 t (2006)	531 t (1996)	21 t (2008)
Carcharhinus leucas	CCE	Bull shark	<0 t	375 t (2003)	<1 t (2008)
Carcharhinus brachyurus	BRO	Copper shark	1 t (2001)	7 t (2008)	7 t (2008)
Carcharhinus brevipinna	CCR	Spinner shark	10 t (2006)	306 t (2002)	306 t (2002)
Carcharhinus signatus	CCS	Night shark	< 1 t	1466 t (2002)	41 t (2008)
Carcharhinus isodon	CCO	Finetooth shark		<1 t (2004)	<1 t (2004)
Carcharhinus altimus	RSH	Bignose shark	<1 t (2003)	43 t (2004)	43 t (2004)
Charcharhinidae	RSK	Requiem sharks nei	20 t (2004)	861 t (2008)	861 t (2008)
Carcharhiniformes	CVX		127 t (2006)	2279 t (2003)	234 t (2008)
	PXX	Pelagic sharks nei	15 t (2005)	1011 t (1997)	15 t (2005)

SOURCE OF MANAGEMENT ADVICE: The advisory body for these species is ICCAT for the tuna and tuna-like fisheries, but also the RFMOs concerned by catches obtained by other gears.

PRECAUTIONARY REFERENCE POINTS: None

STOCK STATUS: No stock assessment was ever attempted by ICCAT or any other RFMO in the area. IUCN carried out some conservation assessments, including the following species in the Red List:
"Low Concern": *C. falciformis*;
"Near Threatened": C. *limbatus, C. melanopterus, C. obscurus, C. leucas, C. brevipinna, C. plumbeus* (IUCN, in 2007, listed this latter species as "Endangered" for the Mediterranean – see STECF comment);
"Vulnerable": *C. longimanus*.

RECENT MANAGEMENT ADVICE: None.

STECF COMMENTS: STECF reiterates the comments made during its Plenary 09-02, about the adoption of a different conservation status in the Mediterranean in the absence a discrete and well-defined sub-population.

STECF recommends the collection of basic information on the catches of the different *Carcharhinus* species occurring in the Mediterranean with the aim of better understanding the current state of these species and assessing the possible impacts of the different fisheries.

10.34. Blue stingray (*Pteroplatytrygon violacea*)

FISHERIES: This species is very commonly caught by pelagic gears (long-lines, driftnets) as by-catch and more rarely by trawlers; it is sometimes retained on board and sold in a few markets. Data on catches are usually extremely poorly reported and no catches of this species are included in the ICCAT data bank at the moment. This species often represents the most common Chondrichthyes species in the pelagic longline fishery in the Mediterranean, abundant in some areas and seasons.

SOURCE OF MANAGEMENT ADVICE: The advisory body for these species is ICCAT for the tuna and tuna-like fisheries, but also the RFMOs concerned by catches obtained by other gears.

PRECAUTIONARY REFERENCE POINTS: None.

RECENT MANAGEMENT ADVICE: None by RFMOs. IUCN (2007) classified this species for the Mediterranean as "Near threatened".

STECF COMMENTS: STECF notes the lack of recent data and recommends a better reporting of the Blue stingray catches from all the fisheries and Member States involved due to the high number of specimens reported in surface fisheries in some geographical areas. STECF recommend that catches of this species must be regularly reported to ICCAT.

11. Highly migratory fish (Indian Ocean)

All the highly migratory species in the Indian Ocean are now managed by the Indian Ocean Tuna Commission (IOTC), an FAO body. This Commission faces a number of difficulties, some of which are related to the number of States taking part in these fisheries. Despite improvements, statistical tables are still not available for all fisheries and particularly for several artisanal fisheries, a very important component for most countries in that area. Many smaller tuna and tuna-like species are not currently examined by the IOTC and data on these species are not available. The situation is slowly improving in the most recent years.

11.1. Pelagic Sharks

FISHERIES: For the Indian Ocean there is currently little quantitative information available on the fisheries targeting or having significant by-catch of pelagic sharks. The following information was taken from: Status of Pelagic Sharks and Rays Report of the IUCN Shark Specialist Group Pelagic Shark Red List Workshop Tubney House, University of Oxford, UK, 19–23 February 2007.
The Indian Ocean borders on the top two shark-fishing nations in the world, Indonesia and India, which together have accounted for 22% of the total FAO-reported chondrichthyan global landings since 2000. Landings of these species have been steadily rising in both the Eastern and Western Indian Ocean since the 1950s, although there has been a slight decline since 2004.
Qualitatively, at least 15 species of sharks are caught in open ocean fisheries in the Indian Ocean, with blue (*Prionace glauca*) and silky (*Carcharhinus falciformis*) sharks probably the most prevalent species, but other species, specifically shortfin mako (*Isurus oxyrinchus*) are also taken in significant number.

SOURCE OF MANAGEMENT ADVICE: The advisory body is IOTC

PRECAUTIONARY REFERENCE POINTS: None.

STOCK STATUS: unknown

RECENT MANAGEMENT ADVICE:
Overall, there is a paucity of information available on sharks and this situation is not expected to improve in the short to medium term. There is no quantitative stock assessment or basic fishery indicators currently available for any of the sharks in the Indian Ocean therefore the stock status for all species is highly uncertain. In general, the life history characteristics of sharks; including that they are relatively long lived, typically take (at least) several years to mature, and have relativity few offspring, means that they are vulnerable to overfishing.

Information in the following four sections is taken from the Report of the Thirteenth Session of the IOTC Scientific Committee Bali, Indonesia, 30th March – 3rd April 2009 and from various scientific papers and assessments presented during the IOTC WPs from 2006 - 2008.

http://www.iotc.org/files/proceedings/2009/s/IOTC-2009-S13-R[E].pdf

11.2. Yellowfin tuna (*Thunnus albacares*)

FISHERIES: Recorded catches from this fishery averaged 50,000 tonnes in the years between 1957 and 1983.

From 1984 on, however, the fishery increased sharply, with catches of 111,000 recorded in 1984, 209,000 t in 1989, and almost 400,000 tonnes in 1993. Total annual catches averaged 434,800 t over the period 2003 to 2007. Total catches peaked at 447,700 t in 2003, 511,200 t in 2004 and 490,400 t in 2005 before decreasing to 407,000 t in 2006. Catches in 2007 were 316,700 t and it appears that the catches have returned to pre 2003 levels. Much of this increase can be attributed to the arrival of EU purse seiners in the Indian Ocean.

This stock is exploited mainly by purse seines (about 67% of the catch) and longlines. Artisanal catches, taken by bait boat, gillnet, troll, hand line and other gears have increased steadily since the 1980s. The location of the fishery has changed little since 1990. Yellowfin tuna is fished throughout the Indian Ocean, with the majority of the catches being taken in western equatorial waters.

There are some concerns regarding purse seine fishing using floating FADs, which has led to a rapid increase in the catch of juvenile yellowfin. After an initial decline, mean weights in the whole fishery remained quite stable from the 1970s to the early 1990s. Since 1993, mean weights in the catches in the industrial fisheries have declined. Prior to 2003, although total catch in biomass has been stable for several years, catches in numbers have continued to increase, as there has been more fishing effort directed towards smaller fish. As described above, this situation changed during 2003, 2004 and 2005; where most of the very large catches were obtained from fish of larger sizes. The very recent increases in catches in general has not been as a result of geographic expansion to previously unfished areas, but rather as a result of increased fishing pressure on existing fishing grounds.

SOURCE OF MANAGEMENT ADVICE: The advisory body is IOTC.

PRECAUTIONARY REFERENCE POINTS: None

STOCK STATUS: Estimates of current status of the stock in relation to biomass and fishing mortality reference points were sensitive to the value assumed for steepness of the stock-recruitment relationship so the following results are reported with respect to a range of plausible steepness values (0.6 to 0.8).
Estimates of current adult and total biomass are above or just below their respective MSY-based reference points (B_{MSY} and SB_{MSY}), indicating that the stock is close to, or possibly has recently entered, an over-fished state.
Current (2007) fishing mortality estimates were above their respective MSY-based reference points for all but one of the assessments examined, i.e. $F_{CURRENT}/F_{MSY}$ ratios range from 0.9 to 1.60 indicating that overfishing is occurring. This current degree of overfishing is somewhat lower than that estimated occurred during the 2003-2006 period when the F/F_{MSY} ratio ranged from 1.22 to 1.75.
The stock assessments, including independent analyses of the tagging data, indicate that recruitment has declined in recent years.
The estimates of MSY ranged between 250,000 t and 300,000 t based on the integrated assessment that used the tagging data, although other model results expand this range to 360,000 t. The 2007 catch of 317,000 t may have been above the MSY while annual catches over the period 2003-2006 (averaging 464,000 t) were substantially higher than this range of MSY estimates.

RECENT MANAGEMENT ADVICE: At the 13th session of the IOTC in March 2009, Bali the commission provided the following advice on yellowfin tuna. Stock size is close to or has possibly entered an overfished state. Fishing pressure has been too high in recent years, but was somewhat lower in 2007. The catch of yellowfin tuna should not exceed the average catch for the period 1998-2002 (i.e. 330,000 t) and fishing effort should not exceed the level exerted in 2007.

This information was based in the assessment provided by the 10th working party (Oct 2008, Bangkok, which provided the additional management advice:

While the WPTT acknowledges the preliminary nature of the yellowfin tuna assessment in 2008, all results indicate that fishing mortality should not return to the high levels observed in recent years (2003-2006).

Given the extraordinarily high catches in 2003-2006, it is likely that overfishing was occurring over that period; however, it is not clear if the stock is currently overfished or whether a return to a level of fishing pressure equivalent to that existing just prior to 2003 will lead to the stock being overfished.

The WPTT considers that the status of the stock of yellowfin is not going to change markedly over the next year and recommends that fishing pressure be closely monitored and assessments be undertaken annually for the next

several years. However, the WPTT forewarns, that if the results of the 2008 assessment are confirmed in 2009, then changes to the current fishery in terms of catches and/or effort will likely be recommended.

STECF COMMENTS: STECF agrees with the advice from IOTC and stresses the importance of avoiding any further increase of fishing effort and catches above the 1998-2002 level and based on previous advice underlines the need to reduce the catches of juveniles.

11.3. Bigeye tuna (*Thunnus obesus*)

FISHERIES: Bigeye tuna is predominantly caught by industrial (long line and purse seine) and occasionally by artisanal fisheries. Longline fisheries started to target bigeye in the 1970s and mainly catch adults >80 cm. There was a rapid development of the purse seine fisheries during the 1990s in association with drifting and floating FADs. These fleets mainly catch small fish <80 cm. The location of the fishery has changed little since 1990. Bigeye tuna is fished throughout the Indian Ocean, with the majority of the catch being taken in western equatorial waters.

Reported total catches in the Indian Ocean of bigeye tuna peaked during 1997-99 at 144-150,000 t per year. Total annual catches averaged 121,700 t over the period 2003 to 2007. The 2006 catch was 112,100 t and the provisional 2007 catch stands at 117,900 t.

Over 75% of purse seine bigeye catches are taken in log-schools along with skipjack and yellowfin tuna. Catches increased since the beginning of the fishery, peaked at over 30,000 t from 1997 to 1999 and then stabilized at around 20,000 t.

Much of the bigeye catches from the purse seine fleets are juveniles (under 10 kg), and this results in purse seiners taking a larger numbers of individual fish than longliners. Large bigeye tuna (above 30 kg) are primarily caught by longlines, and in particular deep longliners.

SOURCE OF MANAGEMENT ADVICE: The advisory body is IOTC.

PRECAUTIONARY REFERENCE POINTS: None.

STOCK STATUS: The 9th IOTC WP on tropical tunas performed a new assessment of this stock in 2006 using 5 models: SS2, ASPM, ASPIC, SP Bayes-Baynesian Pella-Thompson and CASAL. From the resulting range of MSY estimates, a value of 111,200 t (estimated by ASPM) was reported ahead of the estimates from the other methods. Given that the mean annual catch for the period 2002-2006 was 121,800 t and the catch estimate for 2006 is 105,700 t, it appears that the stock is being exploited at around its maximum level. Furthermore, the spawning stock biomass appeared (in 2006) to be above the level that would produce MSY while the fishing mortality in 2004 was below the MSY level. Conversely biomass trajectories indicate that the spawning stock biomass has been declining since the late 1970‘s while fishing mortality has been increasing steadily since the 1980‘s
In addition the outlook would revert to a more pessimistic one if, as expected, the exploitation pattern reverted to a pre-2003 one. In this context, by 2005 the fishery was already showing a return to a pre-2003 exploitation pattern with increased catches of bigeye tuna associated with floating objects.

It should be noted that these results are all impaired by a lack of catch-at-size data for various fisheries and various uncertainties: recruitment (which has been assumed independent of the spawning stock biomass), growth, conversion factors and changes in catchability.

Maximum Sustainable Yield:	111,200 t (95,000 – 128,000)
Preliminary catch in 2006 *(data as of October 2007)*	105,700 t
Catch in 2005	114,600 t
Mean catch over the last 5 years (2002-2006)	121,800 t
Current Replacement Yield	-
Relative Biomass (SSB_{2004}/SSB_{MSY})	1.34 (1.04 – 1.64)
Relative Fishing Mortality (F_{2004}/F_{MSY})	0.81 (0.54 – 1.08)

The recent evaluation of the 10th IOTC WP which preformed a preliminary analysis of tagging information provided no new advice, but stated that the initial analyses of tagging data indicate that the probability of B2007

being greater than BMSY was high (i.e. an 86 % chance) and exploitation rates for ages 0-2 years appear to be below MSY levels.

RECENT MANAGEMENT ADVICE: The stock size and fishing pressure in 2004 were within acceptable limits. Catch rates have gradually declined since 1980. In 2008, preliminary assessment results based on tagging data suggest a high probability that the stock is not in an overfished state. Catches should not exceed the MSY and fishing effort should not increase further from the 2004 levels.
STECF COMMENTS: STECF agrees with IOTC advice and stresses the importance of keeping the total catch and effort under strict control, as well as reducing catches of juveniles.

11.4. Skipjack (*Katsuwonus pelamis*)

FISHERIES: Catches of skipjack increased slowly from the 1950s, reaching around 50,000 t at the end of the 1970s, mainly due to the activities of baitboats (or pole and line) and gillnets. Catches increased rapidly with the arrival of the purse seiners in the early 1980s, and skipjack became one of the most important tuna species in the Indian Ocean. The annual total catches exceeded 400,000 t in the late 1990's and the average annual catch for the period from 2002 to 2006 was 514,100 t (catches in 2006 may have been the highest reported in the history of the fishery 596,200 t). The trend in catches is, in particular, due to an expansion of the FAD-associated fishery. Nor is there any sign that the rate of increase is diminishing in recent years: catches in 2004 were 464,500 t rising to 529,600 t in 2005 and 612,200 t in 2006, but dropping to 447,100 t in 2007 mainly due to lower catches in the purseine fleet.

In recent years, the proportions of the catch taken by the industrial purse seine fishery and the various artisanal fisheries (baitboat, gillnets and others) have been fairly consistent, the majority of the catch originating from the western Indian Ocean. IOTC estimates that 30 to 40 % of the total catch of skipjack is taken in gillnet fisheries (mainly from Sri Lanka, Iran, Pakistan, India and Indonesia).

The increase of skipjack catches by purse seiners is due in large part to the development of a fishery in association with Fish Aggregating Devices (FADs). Currently, 80 % of the skipjack tuna caught by purse-seine is taken under FADs. In addition catch rates by purse seiners show an increasing trend in two of the three main fishing areas possibly due to an increase in fishing power and to an increase in the number of FADs (and the technology associated with them) in the fishery.

SOURCE OF MANAGEMENT ADVICE: The advisory body is IOTC.

PRECAUTIONARY REFERENCE POINTS: None

STOCK STATUS: While no quantitative stock assessment is currently available for skipjack tuna in the Indian Ocean, the range of stock indicators available does not currently signal any problems in the fishery. For example, IOTC has noted that catches have continued to increase as effort increased. Furthermore, the majority of the catch comes from fish that are sexually mature (greater than 40 cm) and therefore likely to have already reproduced. Conversely IOTC also notes that, although there might be no reason for immediate concern, it is clear that the catches cannot be increased at the current rate indefinitely. Therefore, it has recommends that skipjack be monitored regularly.

RECENT MANAGEMENT ADVICE:
Skipjack is a highly productive species. Catches have increased with increasing fishing pressure with no symptoms for concern in the status indicators. Stock size and fishing pressure are considered to be within acceptable limits. There is no need for immediate concern.

STECF COMMENTS: STECF accepts that while there are currently no warring indications coming from the assessment of this stock, it is clear that the catches cannot be increased at the current rate indefinitely. Therefore, it agrees with the IOTC advice that skipjack be monitored appropriately and regularly. In addition it shares the concerns expressed by IOTC regarding the effect of the extensive and growing 'FAD' fisheries on juveniles of other tuna species. These should be strictly monitored and evaluated.

11.5. Swordfish (*Xiphias gladius*)

FISHERIES: Swordfish in the Indian Ocean is caught mainly using drifting longlines (95%) and gillnets (5%). Swordfish was mainly a bycatch of industrial longline fisheries before the early 1990's. Catches increased gradually from 1950 to 1990 as the catches of targeted species (such as tropical and temperate tunas) increased. Catches increased markedly after 1990 to peaks of around 35,000 tonnes in 1998 and 36,000 tonnes in 2003 and 2004. The current catch of swordfish is around 30,000 tonnes. The increase in catch is attributed to a change in target species from tunas to swordfish by part of the Taiwanese fleet, the development of longline fisheries in Australia, La Reunion, Seychelles and Mauritius targeting swordfish, and the arrival of longline fleets from the Atlantic Ocean (Portugal, Spain and other fleets operating under various flags) also targeting swordfish.
The largest catches are obtained in the southwestern Indian Ocean. By-catches and discards (mainly sharks and billfish) are important in these fisheries. While the data for this stock are improving with time, major gaps remain particularly gaps in the time series, under-reporting of discards, lack of size-frequency data as well as problems with aggregation and misidentification.

SOURCE OF MANAGEMENT ADVICE: The advisory body is IOTC

PRECAUTIONARY REFERENCE POINTS: None.

STOCK STATUS: In 2009 the 7th IOTC WP on Billfish in the Seychelles carried out assessments on swordfish using a number of models (SS3, ASPIC, ASIA, ASPM). The WP was unable to decide on a single model on which to base it advice. The combined results suggest that MSY could reasonably be in the range of ~28-34,000 tonnes, though this is the lower end of the range for some models and the upper end of the range for others. Similarly, all approaches (except ASPM) suggest that depletion could be in the range of B2007/B0 = 0.4 – 0.5, though again this may be an upper or lower end of the plausible range depending on the model. Comparison across models suggest that current catches are probably near MSY (and F is probably near FMSY), but could be somewhat above or below.
Given the general recent declining trend in all the CPUE series, and the fully exploited status of the stock, the WPB expects that abundance will likely decline further at current effort levels, especially considering that the issue of increases in efficiency has not been fully addressed in the current standardization. When combined with the uncertainty in the assessment, the WPB considers that there is a reasonably high probability that common target and limit reference points (*eg*. BMSY, $0.4B_0$) may be marginally exceeded, and this probability will increase over time if effort remains at current levels or increases further. There does not seem to be a strong conservation-based justification for highly disruptive management action at this time, but precautionary measures such as capacity control or catch limits will reduce the risk of creating an overcapacity problem or increasing the risk of exceeding common biomass limit reference points.
The apparent fidelity of swordfish to particular areas is a matter for concern as this can lead to localised depletion. The CPUE of the Japanese fleet in the south west IO has the strongest decline of the four areas examined in 2009; furthermore, the La Reunion CPUE series shows a declining trend in this area over the last 10 years. In previous years, localised depletion was inferred on the basis of decreasing CPUEs following fine-scale analyses of the catch and effort data. Therefore the WPB cannot discount the possibility that localised depletion is still occurring in some areas. Localised depletion has occurred in other parts of the world where swordfish have been heavily targeted.

RECENT MANAGEMENT ADVICE:
The 13th session of the IOTC advised that the overall stock size and fishing pressure are within acceptable limits on the basis of the 6th IOTC WP report. However, there have been some localised declines possibly related to high fishing pressure in some areas (e.g. in the southwest Indian Ocean area). Catches should not increase above the 2006 levels and fishing effort should not increase from the 2007 levels. Furthermore, management measures focused on controlling and/or reducing effort, especially in the south-west Indian Ocean are recommended.

STECF COMMENTS: STECF agrees with the advice from IOTC. STECF notes that the most recent advice was issued on the basis of the assessment carried out in 2008, with new advice likely to be given during the IOTC session in December 2009. The information above relating to stock status is from the 2009 assessment.

12. Highly Migratory fish (Northeastern, eastern, southern and western-central Pacific)

As a general remark, the management of highly migratory species in the Pacific Ocean remains very unclear. The Inter-American Tropical Tuna Commission (IATTC), an FAO body, has managed stocks in the Eastern Pacific Ocean for many years; the Western Central Pacific Fishery Commission (WCPFC) manages stocks in the Western and Central Pacific Ocean; the Southern Pacific Communities (SPC) also plays a role managing some stocks in the Southern Pacific Ocean while, more recently, the International Scientific Committee for Tuna and Tuna-like species in the North Pacific Ocean (ISC) provides management advice for the migratory tuna and tuna-like species in the Northern Pacific Ocean. Other smaller bodies also play a role. These Commissions faces a number of difficulties, some of which are related to the number of States taking part in these fisheries and the huge marine area concerned. Despite improvements, statistical tables are still not available for all fisheries and particularly for several artisanal fisheries, a very important component for most countries in that area. Importantly, data reported to FAO Fishstat differ (sometimes significantly) from those reported to the various Commissions; these discrepancies should be addressed as a matter of priority.

Thus, the management of several stocks remains uncertain and/or undefined, without specific boundaries, sometimes with several overlapping competencies and, in some cases, with conflicting data published by different management bodies for the same stock. Many smaller tuna and tuna-like species are not currently monitored or assessed by these Commissions and data on those species are not available.

12.1. Pacific Bluefin tuna (*Thunnus orientalis*)

FISHERIES: It is assumed that there is one single stock of Pacific bluefin that spawn in waters between the Philippines and Japan before migrating more than 11,100 kilometres to the Eastern Pacific, only to return to their birth waters to spawn again. Tagging studies have shown that there is exchange of Pacific bluefin between the eastern and western Pacific Ocean. Larval, postlarval, and early juvenile bluefin have been caught in the WPO, but not the EPO, so it is likely that there is a single stock of bluefin in the Pacific Ocean.

Most bluefin catches in the eastern Pacific Ocean are taken by purse seiners from May through October. Bluefin caught in the western Pacific are exploited by various gears at different times of the year: trolling from July to October of younger fish about 15-30 cm in length; trolling from November to April of younger fish about 35-60 cm in length; purse seining of older fish from May to September; and other gears (traps, gillnets, pole-and-line, longlining) throughout the year. Pacific bluefin tuna is primarily exploited by Japanese, Korean, Taiwanese, Mexican and US fleets. EU vessels have never exploited this stock.

The total catch has fluctuated between 8,500 t in 1990 and 38,000 t in 1956. Recent catches are relatively higher, and the average for the past five years was 22,300 t. During the same period, Japan's catch accounted for 40–60% of the total catch, followed by Mexico and Korea. Catches by some nations have increased recently, for example by Mexico in its Baja fishery for farming. This fishery takes a wide variety of fish sizes, including relatively small fish, which is a concern with respect to stock status (WCPC 2007).

The total catch between 1976 and 2005 ranged from 31,376 t to 6,721 t in the WPO and from 32,482 t to 8,376 t in the EPO. Catches in the WPO have varied in recent years and in 2008 amounted to 20,403 t. In the WPO Japanese longliners take the major part of the reported catches (83,5% in 2007).

In the EPO the estimated catches for 2008 were 4,501 t, showing a strong decrease (>50%) from 2006. Almost all of the catches in EPO are taken by purse seines (4,245 t, in 2007 by Mexico alone), but data from the longline fishery are missing in 2007.

SOURCE OF MANAGEMENT ADVICE:

Bluefin tuna in the north Pacific is co-operatively managed by two regional fisheries management organizations: the 16-member Inter-American Tropical Tuna Commission (IATTC) and the 26-member Western and Central Pacific Fisheries Commission (WCPFC). Note: Southern bluefin tuna, which frequent both the Pacific and Indian Oceans, is managed by the five-member Commission for the Conservation of Southern Bluefin Tuna (CCSBT). The Scientific Committee of the Western and Central Pacific Fisheries Commission has performed a comprehensive assessment of this stock in 2009.

PRECAUTIONARY REFERENCE POINTS: None.

STOCK STATUS: The most recent stock assessment of Pacific bluefin tuna was conducted in 2008 by the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific. It noted that while the spawning biomass is currently at historically median levels at 20,000 t, the recruitment of young fish (age 0) is highly variable, catch weight is dominated by young fish and juveniles (ages 0 to 3), and current fishing mortality is greater than the reference points that are generally used by scientists as potential target for fishing mortality. The Committee also assessed the effects of environmental changes on these tuna. Based on their observations and uncertainties, the Committee advised that current levels of fishing could continue if environmental conditions remained the same, but they also noted that if fishing effect was reduced, it could, over time, lead to higher yields. Finally, the Committee cautioned that increases in current fishing levels or any unfavourable changes in environmental conditions might reduce recruitment and noted that this would be cause for concern.

RECENT MANAGEMENT ADVICE: Noting the uncertainty in the assessments, the International Scientific Committee has provided the following conservation advice:

- If F remains at the current level and environmental conditions remain favourable, the recruitment should be sufficient to maintain current yield well into the future.
- A reduction in F in combination with favourable environmental conditions, should lead to greater SPR.
- Increases in F above the current level, and/or unfavourable changes in environmental conditions, may result in recruitment levels which are insufficient to sustain the current productivity of the stock.
- Given the conclusions of the May-June 2008 stock assessment with regard to the current level of F relative to potential target and limit reference points, and residual uncertainties associated with key model parameters, it is important that the current level of F is not increased.
- Given the conclusions of the July 2009 PBFWG, the current level of F relative to potential biological reference points, and increasing trend of juvenile F, it is important that the current [sic] level of F is decreased below the 2002-2004 levels on juvenile age classes.

STECF COMMENTS:

STECF stresses the need to have a clear management responsibility for this species attributed to a single Fishery Commission or to a Joint Expert Group, to avoid the possibility of competency conflicts and contradictory advice.

12.2. Eastern Pacific Yellowfin (*Thunnus albacares*)

FISHERIES: Yellowfin are distributed across the Pacific Ocean, but the bulk of the catch is made in the eastern and western regions. The purse-seine catches of yellowfin are relatively low in the vicinity of the western boundary of the EPO. The movements of tagged yellowfin are generally over hundreds, rather than thousands, of kilometers, and exchange between the eastern and western Pacific Ocean appears to be limited. This is consistent with the fact that longline catch-per-unit-of-effort (CPUE) trends differ among areas. It is likely that there is a continuous stock throughout the Pacific Ocean, with exchange of individuals at a local level, although there is some genetic evidence for local isolation. Movement rates between the EPO and the western Pacific cannot be estimated with currently-available tagging data.

The average annual catch in the EPO during the period 1991-2006 varied from 174,000 to 443,000 t (average 271,000). Catches in 2002 were the highest on record (443,000 t), while those in 2004, 2005 and 2006 decreased substantially with the catch in 2007 (about 173,413 t) the lowest since 1984. Preliminary catch data for 2008 (to August 31) is 144,449 t. The average weights of the yellowfin caught in 2006 were significantly lower than those of the previous five years

SOURCE OF MANAGEMENT ADVICE: The advisory body is IATTC.

PRECAUTIONARY REFERENCE POINTS: None: the use of a spawning stock - biomass ratio (SBR) proposed.

STOCK STATUS: The most recent stock assessment[6] of yellowfin tuna (*Thunnus albacares*) in the eastern Pacific Ocean (EPO) was undertaken using an integrated statistical age-structured stock assessment model

[6] http://www.iattc.org/PDFFiles2/SARM-10-06a-YFT-assessment-2008.pdf

(Stock Synthesis Version 3; Methot, 2005, 2009) based on the assumption that there is a single stock of yellowfin in the EPO. This model differs from that used in previous assessments.

It appears that the yellowfin population has experienced two, or possibly three, different recruitment regimes (1975-'82, 1983-2001, and possibly 2002-'06) corresponding to low, high, and intermediate recruitment.

The spawning biomass ratio (SBR: ratio of spawning biomass to that of the unfished stock) was below the level corresponding to the average maximum sustainable yield (A_{MSY}) during the lower productivity regime, but above that level during the following years, except for the most recent period 2004-2007. The 1984 increase in the SBR is attributed to a regime change, while the recent decrease may be a reversion to an intermediate recruitment regime.

The two different productivity regimes may support two different MSY levels and associated SBR levels. The SBR at the start of 2009 is estimated to be above the level corresponding to the MSY. The effort levels are estimated to be less than those that would support the MSY (based on the current distribution of effort among the different fisheries), but recent catches are substantially below MSY.
The MSY calculations indicate that, theoretically, at least, catches could be increased if the fishing effort were directed toward longlines and purse-seine sets on yellowfin associated with dolphins. This would also increase the SBR levels.
The MSY has been stable during the assessment period, which suggests that the overall pattern of selectivity has not varied a great deal through time. However, the overall level of fishing effort has varied with respect to the level corresponding to MSY.[7]
If a stock-recruitment relationship is assumed, the outlook is more pessimistic, and current biomass is estimated to be below the level corresponding to the MSY. The status of the stock is also sensitive to the value of adult natural mortality, the method used to model selectivity, and the assumed length of the largest age.

RECENT MANAGEMENT ADVICE: Significant levels of fishing mortality have been estimated for the yellowfin fishery in the EPO. These levels are highest for middle-aged yellowfin. Despite more catch being taken in schools associated with dolphins than the other fisheries, the floating object and purse seine sets on unassociated schools have a greater impact on the yellowfin spawning biomass.
Under current levels of fishing mortality (2006-2008), the spawning biomass is predicted to slightly decrease, but remain above the level corresponding to MSY. However, the confidence intervals are wide, and there is a moderate probability that the SBR will be substantially above or below this level. It is predicted that the catches will be higher over the near term than in 2008, but will decline slightly in the future. Fishing at F_{msy} is predicted to reduce the spawning biomass slightly from that under current effort and produces slightly higher catches.
In 2009, IATTC, whilst noting that catches of yellowfin tunas have decreased, also consider that capacity continues to increase in this fishery; that the yellowfin tuna resource in the EPO supports one of the most important surface fisheries for tunas in the world; and that tuna studies indicate that the spawning stock will likely decline under current levels of fishing mortality;.
In June 2009 IATTC adopted RESOLUTION[8] C-09-01: on a multiannual program for the conservation of tuna in the eastern pacific ocean in 2009-2011. This resolution provides a number of general measures applicable in the years 2009-2011 to all purse-seine vessels of IATTC capacity classes 4 to 6 (more than 182 metric tons carrying capacity), and to all longline vessels over 24 meters length overall, that fish for yellowfin (and bigeye and skipjack) tunas in the EPO. Specific measures in respect of yellowfin tuna include

- All purse-seine vessels covered by the resolution must stop fishing in the EPO for a period of 59 days in 2009, 62 days in 2010, and 73 days in 2011.
- The fishery for yellowfin tuna by purse-seine vessels within the area of 96º and 110ºW and between 4°N and 3°S be closed from 0000 hours on 29 September to 2400 hours on 29 October, 2009-2011.

STECF COMMENTS: STECF agrees with the advice from IATTC.

[7] Note: the SBR corresponding to MSY decreased substantially from the previous assessment indicating that the results are sensitive to the change in methodology. The change is attributed to the method used to model selectivity. However, the SBR relative to SBR-MSY (i.e. relative to the SBR corresponding to MSY) and the F multiplier are similar to the previous assessment.
[8] http://www.iattc.org/PDFFiles2/C-09-01-Tuna-conservation-2009-2011.pdf

12.3. Western and Central Pacific Yellowfin (*Thunnus albacares*)

FISHERIES: The development of this fishery is recent in comparison to many other tuna fisheries. Purse seiners harvest about 53% of the total catch, while longline and pole-and-line fleets comprise 16% and 3% respectively.

In the WCPO catches reached 353,000 t in 1990, peaked at 462,000 t in 1998 and remained high through 2003; the low catch rates observed during 2002 in the purse-seine fishery are considered unusual for an *El Nino* event. Catches dropped to 362,431 t in 2004, increased again in 2005 to 435,876 t and fell to 399,828 t in 2006. Data from 2007 preliminarily suggests landings of 431,814 t. The most likely cause of lesser catches is a decline in recruitment.

The European purse-seine fleet has been operating in the WCPO since 1999, albeit with sporadic catches. This fleet consists of five large purse-seiners with 100% onboard observer coverage (Agreement on the International Dolphin Conservation Program - AIDCP).

The Spanish surface longline fleet started fishing in WCPFC waters in 2004. In 2007 Spain reported a total retained catch of 4,019 t and 5.3 t of discards[9].

SOURCE OF MANAGEMENT ADVICE: While there is no specific management body for this species, WCPFC does provide management advice, supported by the Oceanic Fishery Programme (South Pacific Community) and the International Science Committee. The primary assessment tool used to asses the stock is MULTIFAN-CL . The Stock Assessment - Scientific Working Group (SA-SWG) of the South Pacific Community (SPC) revised all available data in 2007. No stock assessment was conducted in 2008

PRECAUTIONARY REFERENCE POINTS: None.

STOCK STATUS: The 2007 stock assessment conclusions differ slightly from the 2006 assessment, particularly in relation to the ratio of the current estimate of fishing mortality compared with the fishing mortality at maximum sustainable yield (F/F_{MSY}), with the threshold in the 2007 assessment being slightly more optimistic than that in the 2006 assessment.

While the point estimate of F/F_{MSY} remains slightly less than 1.0 (0.95), the probability distribution associated with the fishing mortality-based reference point indicates that there is almost an equal probability that the value of F/F_{MSY} is less than or greater than the reference point. Therefore, the possibility of overfishing is still relatively high (47%).

The reference points that predict the status of the stock under equilibrium conditions are B/B_{MSY} (1.10) and SB/SB_{MSY} (1.12), which indicate that the long-term average biomass would remain slightly above the level capable of producing MSY at 2002−2005 average fishing mortality.

Overall, current biomass exceeds the estimated biomass at MSY (B/B_{MSY} >1.0) indicating that the yellowfin stock in the WCPO is not in an overfished state, although there is a small probability (6.2%) that it is in an overfished state.

The change in the estimated MSY in 2007 from that in 2006 may reflect changes in the data structure, fishery designations and levels of uncertainty in the assessment, especially in estimating absolute values, and the change in the scenarios modelled between years.

RECENT MANAGEMENT ADVICE: The Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean noted that since no stock assessment was conducted in 2008, new management advice was not provided. The Committee went on to note that previous management advice (from SC3 to the Commission) was that the WCPO yellowfin tuna fishery can be considered to be fully exploited, with both the 2006 and 2007 assessments indicating a high probability that overfishing is occurring. In order to reduce the likelihood of overfishing or the manager's wishes to maintain average biomass at levels greater than 5% above B_{MSY}, reductions in the rate of fishing mortality would be required.

STECF COMMENTS: STECF supports the management advice of WCPFC. STECF underlines the need to have a clear management responsibility for this species attributed to a single Fishery Commission or to a Joint

[9] Discards for the Spanish catches are reported for all areas together; then, discards in the WCPO were calculated on a proportional base.

Expert Group, to avoid the existing overlapping of advice arising from at least two separate stock assessments covering the areas for the separate Commissions involved.

12.4. Pacific Bigeye (*Thunnus obesus*)

FISHERIES: Bigeye are distributed across the Pacific Ocean, but the bulk of the catch is made to the east and to the west of the mid-Pacific. The purse-seine catches of bigeye are substantially lower close to the western boundary (150ºW) of the EPO; the longline catches less sporadic, but at lower levels between 160ºW and 180º.

Bigeye are not often caught by purse seiners in the EPO north of 10ºN, but a substantial portion of the longline catches of bigeye in the EPO is made north of that parallel. Bigeye tuna do not move long distances (95% of tagged bigeye showed net movements of less than 1000 nautical miles), and current information indicates little exchange between the eastern and western Pacific Ocean. This is consistent with the fact that longline catch-per-unit-of-effort (CPUE) trends differ among areas. It is likely that there is a continuous stock throughout the Pacific Ocean, with exchange of individuals at local levels. Currently, there are not enough tagging data to provide adequate estimates of movement between the eastern and western Pacific Ocean.

There have been substantial changes in the bigeye tuna fishery in the eastern Pacific Ocean (EPO) over the last 15 years. Initially, the majority of the bigeye catch was taken by longline vessels, but with the expansion of the fishery on fish associated with fish aggregating devices (FADs) since 1993, the purse-seine fishery has taken an increasing proportion of the bigeye catch.

Overall, the catches in both the EPO and WCPO have increased, but with considerable fluctuation. The catches in the EPO reached 105,000 t in 1986, and have fluctuated between about 73,000 and 148,000 t since then, with the greatest catch in 2000.

In the WCPO the catches of bigeye increased to more than 77,000 t during the late 1970s, decreased during the 1980s, and then increased, with lesser fluctuations, until 1999, when the catches reached more than 115,000 t. Catches of bigeye in the WCPO increased significantly in 2004 to 146,000 t. In 2005 and 2006 the catches of bigeye in the WCPO were 132,000 and 114,000 t, respectively.

Prior to 1994, the average annual retained catch of bigeye taken by purse-seine vessels in the EPO was about 8,000 t (range 1,000 to 22,000 t). Following the development of FADs, the annual retained purse-seine catches increased from 35,000 t in 1994 to between 44,000 and 95,000 t during 1995-2000.

A preliminary estimate of the retained catch in the EPO in 2007 is 61,000 t. The average amount of bigeye discarded at sea during 1993-2006 was about 5% of the purse-seine catch of the species (range: 2 to 12%).

Small amounts of bigeye have been caught in some years by pole-and-line vessels. During 1978-1993, prior to the increased use of FADs and the resulting greater catches of bigeye by purse-seine vessels, the longline catches of bigeye in the EPO ranged from 46,000 to 104,000 t (average: 74 thousand t) about 89%, on average, of the retained catches of this species from the EPO. During 1994-2006 the annual retained catches of bigeye by the longline fisheries ranged from about 35 to 74 thousand t (average: 53 thousand t), an average of 45% of the total catch of bigeye in the EPO. The preliminary estimate of the longline catch in the EPO in 2007 is 26 thousand t.

SOURCE OF MANAGEMENT ADVICE: While there is no specific advisory body for this species, various bodies (IATTC, WCPTC, ISC and SPC) conduct assessments. The Stock Assessment - Scientific Working Group (SA-SWG) of the South Pacific Community (SPC) revised all available data in 2005 and carried out a new stock assessment. IATTC also conducted an assessment in 2009.

PRECAUTIONARY REFERENCE POINTS: Maintaining tuna stocks at levels that produce the MSY is the management objective specified by the IATTC Convention; however IATTC has not adopted any target or limit reference points for this stock.

STOCK STATUS: The most recent stock assessment[10] of bigeye tuna (*Thunnus obesus*) in the eastern Pacific Ocean (EPO) was undertaken using an integrated statistical age-structured stock assessment model (Stock Synthesis Version 3; Methot 2005, 2009.).

At the beginning of January 2008, the spawning biomass of bigeye tuna in the EPO was near the historic low level. At that time the SBR was about 0.17, about 11% less than the level corresponding to the MSY.

[10] http://www.iattc.org/PDFFiles2/SARM-10-06b-BET-assessment-2008.pdf

Recent catches are estimated to have been 19% higher than MSY levels. If fishing mortality is proportional to fishing effort, and the current patterns of age-specific selectivity are maintained, the level of fishing effort corresponding to the MSY is about 81% of the current (2006-2008) level of effort. The MSY of bigeye in the EPO could be maximized if the age-specific selectivity pattern were similar to that for the longline fishery that operates south of 15N because it catches larger individuals. Before the expansion of the floating-object (FAD) fishery that began in 1993, the selectivity was such that MSY was greater than the current MSY and the fishing mortality was less than F_{MSY}.

All analyses indicate that, at the beginning of 2009, the spawning biomass was probably below SB_{MSY}. The MSY and the F multiplier are sensitive to model choice, but under all scenarios considered, fishing mortality is well above F_{MSY}.

Recent spikes in recruitment are predicted to result in stabilized levels of SBR and increased longline catches for the next few years. However, current levels of fishing mortality would subsequently reduce the SBR. Under current effort levels, the population is unlikely to remain at levels that support MSY unless fishing mortality levels are greatly reduced or recruitment is above average for several consecutive years.

These simulations are based on the assumption that selectivity and catchability patterns will not change in the future. Changes in targeting practices or increasing catchability of bigeye as abundance declines (*e.g.* density-dependent catchability) could result in differences from the outcomes predicted here.

RECENT MANAGEMENT ADVICE: In 2009, IATTC, whilst noting that catches of bigeye tunas have decreased, also consider that capacity continues to increase and that the stock is below a level that would produce the maximum sustainable yield (MSY).

In June 2009 IATTC adopted RESOLUTION[11] C-09-01: on a multiannual program for the conservation of tuna in the eastern pacific ocean in 2009-2011. This resolution provides a number of general measures applicable in the years 2009-2011 to all purse-seine vessels of IATTC capacity classes 4 to 6 (more than 182 metric tons carrying capacity), and to all longline vessels over 24 meters length overall, that fish for yellowfin, bigeye and skipjack tunas in the EPO. Specific measures in respect of bigeye tuna include

- All purse-seine vessels covered by the resolution must stop fishing in the EPO for a period of 59 days in 2009, 62 days in 2010, and 73 days in 2011.
- The fishery for bigeye tuna by purse-seine vessels within the area of 96º and 110ºW and between 4°N and 3°S be closed from 0000 hours on 29 September to 2400 hours on 29 October, 2009-2011.
- CPC's to take the measures necessary to control the total annual catch of bigeye tuna in the EPO during 2009-2011 by longline tuna vessels fishing under its jurisdiction.
- China, Japan, Korea, and Chinese Taipei to take the measures necessary to ensure that their total annual longline catches of bigeye tuna in the EPO during 2009-2011 do not exceed set levels.
- Other CPCs to take the measures necessary to ensure that their total annual longline catches of bigeye tuna in the EPO during 2009-2010 do not exceed the greater of 500 metric tons or their respective catches of bigeye tuna in 2001.

STECF COMMENTS: STECF agrees with the advice from IATTC.

12.5. Eastern Pacific Skipjack (*Katsuwonus pelamis*)

FISHERIES: Catches of Eastern Pacific Skipjack have varied between 52,000 and 311,000 t over the time series. Between 1988 and 2006 the annual retained catch from the EPO averaged 168,914 t however fishing zones have also shown a great variability during the same period. Part of this variability is due to the fact that yellowfin is often preferred to skipjack in the area.

The preliminary estimate of the total catch of skipjack in 2007 is 220,665 t (including discards of 8,896 t), 29% lower than the 2006 catch. Preliminary 2008 catch data (to August 31) indicate a dramatic increase of 58% to 218,175 t over the same period in 2007. Skipjack is primarily caught by purse seiners (99,5% of total skipjack catches in the EPO) from Ecuadorian, Mexican, Panamanian and Venezuelan fleets along with the EU and other South American countries. Spain reported 699 t of retained catches from the WCPO in 2007 along with 8 t of discards[12].

SOURCE OF MANAGEMENT ADVICE: The advisory body is IATTC.

[11] http://www.iattc.org/PDFFiles2/C-09-01-Tuna-conservation-2009-2011.pdf

[12] Discards for the Spanish catches are reported for all areas together; then, discards in the EPO were calculated on a proportional base.

PRECAUTIONARY REFERENCE POINTS: None.

STOCK STATUS: This stock has been assessed in 2001, 2002, 2004, 2006 and 2008, but these assessments are still considered preliminary. The results of the 2008 assessment look more reasonable, possibly due to the improvement of data. One main point is that skipjack recruitment is highly variable in this area and induces fluctuations in the biomass, so that it is difficult to estimate the status of this stock (with the model used: A-SCALA).

New data have been included in 2008 trials, showing that strong cohorts entered the fishery in 2002-2003, increasing both the biomass and the catches in 2003. The results of the analysis in 2006, in which an index of relative abundance was developed from the ratio of skipjack to bigeye tuna in the floating object fishery, were consistent with previous assessments, and suggest that there is no management concern for skipjack tuna, apart from the associated catch of bigeye in floating-object sets. However, the results are still very uncertain.

In 2008, trend and yield-per-recruit analyses were performed and showed that the fishing effort reached the highest level since 1991, while the average weight showed a level near to the lowest point, after a continuous decreasing trend since 2000, suggesting high exploration rates. A simple population model fitted to the CPUE and catch data showed that this inconsistency could be explained by increases in both exploitation rates and abundance. Alternatively it is possible that the vulnerability of skipjack to purse seine fishing is increasing.

The most resent information on this stock, posted in May 2009, concerns updated indicators of stock status. This report notes that Skipjack tuna is a notoriously difficult species to assess. Due to skipjack's high and variable productivity (*i.e.* annual recruitment is a large proportion of total biomass), it is difficult to detect the effect of fishing on the population with standard fisheries data and stock assessment methods. This is particularly true for the stock of the EPO, due to the lack of age-frequency data and the limited tagging data. The continuous recruitment and rapid growth of skipjack mean that the temporal stratification needed to observe modes in length-frequency data make the current sample sizes inadequate. Previous assessments have had difficulty in estimating the absolute levels of biomass and exploitation rates, due to the possibility of a dome-shaped selectivity curve (Maunder 2002; Maunder and Harley 2005), which would mean that there is a cryptic biomass of large skipjack that cannot be estimated. The most recent assessment of skipjack in the EPO (Maunder and Harley 2005) is considered preliminary because it is not known whether the catch per day fished for purse-seine fisheries is proportional to abundance. The results from that assessment are more consistent among sensitivity analyses than the earlier assessment, which suggests that they may be more reliable. However, in addition to the problems listed above, the levels of age-specific natural mortality are uncertain, if not unknown, and current yield-per-recruit (YPR) calculations indicate that the YPR would be maximized by catching the youngest skipjack in the model (Maunder and Harley 2005). Therefore, neither the biomass- nor fishing mortality-based reference points, nor the indicators to which they are compared, are available for skipjack in the EPO.
This report goes on to note that the main concern with the skipjack stock is the constantly increasing exploitation rate. However, the data- and model-based indicators have yet to detect any adverse consequence of this increase. The average weight is near its lower reference level, which can be a consequence of overexploitation, but it can also be caused by recent recruitments being greater than past recruitments.

RECENT MANAGEMENT ADVICE: IATTC has given no management advice.

STECF COMMENTS: STECF notes that the level of catches, together with the increased fishing effort and decreasing average weight are reasons for concern about the high level of exploitation of this stock. More detailed analyses are necessary to inform future management measures.

12.6. Western and central Pacific skipjack (*Katsuwonus pelamis*)

FISHERIES: Catches of western and central Pacific skipjack tuna increased steadily from 1970, and more than doubled during the 1980s. The yields were relatively stable during the 1990s and ranged from 870,000 to 1,300,000 tonnes. A Japanese pole-and-line fleet previously dominated the fishery; however this has now been superseded by purse seiners. Over the past 5 years the catch has been at record high levels (exceeding 1.2 Million t annually) and accounting for more than 65% of the total annual catch of principal tuna species landed from the region.

In 2006, an estimated catch of 1,538,112 t of skipjack was reported, while a total of 1,726,702 t were reported in 2007 (the highest recorded catch from this stock). About 85% of the 2007 catch was taken by purse seiners,

10% by pole and line, 4% by other gear types and 1% by longlines. The geographic distribution of fishing activities shows some recent changes.

Spain in 2007 reported 12,688 t of retained catches and about 151 t of discards[13] in the WCPO.

SOURCE OF MANAGEMENT ADVICE: The WCPFC is the management body, supported by the Oceanic Fishery Programme of the Secretariat of the Pacific Community (SPC). A stock assessment was performed in 2008 (using also MULTIFAN-CL). The Stock Assessment - Scientific Working Group (SA-SWG) of the South Pacific Community (SPC) had revised all the available data.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: The 2008 assessment was conducted at two spatial scales: the entire WCPO stratified into six regions and a model restricted to the two regions encompassing the equatorial WCPO. Despite this the major conclusions are essentially unchanged from the last three assessments indicating a strong increase in the purse seine catchability, while the catchability of pole-and-line fleet has decreased.

Recruitment to the stock has been high since the mid-1980s and recent recruitment is estimated to be exceptionally high: this appears to be related to the higher frequency of *El Niño* events

Biomass also increased from the mid-1980s in response to recruitment, and current biomass is well above the biomass that would produce MSY.

Based on the current assessments MSY is estimated to be about 1,280,000 t in and, overall, the results suggest that current exploitation is modest relative to the biological potential of the stock. Continued catches at the 1,200,000 t level are sustainable but only if there is continued high levels of recruitment. These are believed to be determined principally by environmental factors rather than a strong spawner-recruit relationship.

In conclusion, stock size and fishery performance are firstly driven by recruitment variability, which is influenced by environmental conditions (El Niño). The key conclusion of the models presented is that overfishing is not occurring and the stock is far from the overfished state, confirming the results of the previous assessment. According to the 2008 assessment, there is a near zero possibility that $B_{current}/B_{MSY}$ is anywhere close to 1.

RECENT MANAGEMENT ADVICE: Any increase in purse seine catches of skipjack may results in a corresponding increase in fishing mortality for yellowfin and bigeye tuna. WCPFC, in 2005, had decided some management measures, including a limitation of the fishing efforts by purse-seiners and longliners to either the 2004 or average 2001-2004 levels; a control of FAD sets; and observers on board on vessels operating between 20°N and 20°S

STECF COMMENTS: Although the outlook of this stock seems positive, STECF is concerned by the very high level of catch in recent years and the difficulties in monitoring the various fleets concerned. Due to the very high relevance of this stock in terms of fishery, economy, proteins and social benefits and, at the same time, its role in marine ecosystem, a very high level of removals over many years might result in major undesired and unpredictable changes in various sectors, including the pelagic ecosystem.

STECF notes that setting a TAC for this stock is difficult as a large part of the catch is driven by recruitment. which is difficult to predict.

12.7. Northern Pacific Albacore (*Thunnus alalunga*)

FISHERIES: This stock is fished by longliners (from Taiwan, Japan and USA) and by surface fleets (USA). EU vessels have never reported fishing on this stock. Total catches of albacore from the North Pacific peaked in the early 1970s at over 100,000 t per year, and then declined. Catches recovered during the 1990s and reached a peak of 127,376 t in 1999. Preliminary catch estimates in EPO in 2007 were 90,551 t, a value 44.8% higher than the catch in 2006 in the same area. Preliminary catch estimates of the northern Pacific albacore in the WCPO in 2007 are about 35,795 t.

SOURCE OF MANAGEMENT ADVICE: While there is no well-defined advisory body for this species, both the US National Marine Fisheries Service (NMFS) and IATTC monitor this stock. The most recent North

[13] Discards for the Spanish catches are reported for all areas together; then, discards in the WCPO were calculated on a proportional base.

Pacific albacore stock assessment was conducted in 2006 using ISC, and provided conservation advice. The 2006 stock assessment was conducted with the VPA-2BOX model while experimental trials with the Stock Synthesis II (SS2) model were conducted at the 2008 ISC NPAWG meetings. This latter model will be used in the next assessment planned for 2010.

PRECAUTIONARY REFERENCE POINTS: None.

STOCK STATUS: No new assessment of this stock was undertaken. According to the most recent, 2006, assessment, spawning stock biomass shows fluctuations around the modelled time series average (1966–2006) of 100,000 t. The 2006 stock assessment indicated that SSB increased from 73,500 t in 2002 to 153,300 t in 2006 and is projected to increase further to 165,800 t in 2007. The increase is attributable to strong year-classes in 2001 and 2003.
Total catch in 2006 (63,601t) was slightly greater than in 2005 and catch increased substantially to 91,644 t in 2007. The 2007 catch is typical of the catches occurring during the 1996-2004 period. Preliminary catch for 2008 (66,138 t) decreased substantially, returning to a level more typical of the years after 2004.

The estimated spawning stock size in 2006 of 153,300 t is approximately 53% above the overall time series average (1966–2005). Projections (2007–2020), using an average productivity of 27.75 million fish and F equal to 0.75, indicate that the SSB will reach equilibrium by 2015 at 92,600 t (90% CI=62,700–129,300). The population is being fished at roughly $F_{17\%}$ (i.e., $F_{2002\text{-}2004} = 0.75$): this result is similar to the 2004 assessment however $F_{current}$ (0.75) is high relative to commonly used F reference points.

The stock status revision trials in 2008 indicate increases both in catches and CPUE compared to 2005 values. Results of the updated projections (using 2006 and 2007 catch) indicated the SSB estimates in the near future are greater than those estimated in the 2006 stock assessment. This difference is primarily due to the actual catch (in 2007) being less than that assumed in the projection work done in 2006. $F_{SSB\text{-}Min}$ estimates also became higher due to the larger SSB estimate in the near future.

RECENT MANAGEMENT ADVICE: The most recent assessment of North Pacific albacore was conducted at a workshop of the Albacore Working Group of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC), held in November-December 2006. The conclusions reached at this workshop include the following:

- The spawning stock biomass (SSB) in 2006 was estimated to be about 153 thousand t–53% above the long-term average
- Retrospective analysis revealed a tendency to overestimate the abundance of albacore;
- Recruitment had fluctuated about a long-term average of roughly 28 million fish during the 1990s and early 2000s;
- The current coefficient of fishing mortality (F) is about 0.75, which is high relative to several biological reference points to which Working Group compared its estimate for albacore;
- The SSB is forecast to decline to an equilibrium level of about 92 thousand t by 2015;
- The substantial decline in total catch during recent years is cause for concern;

STECF COMMENTS: STECF notes that fishing mortality has markedly increased in recent years. STECF underlines the need to have a clear management responsibility for this species attributed to a single Fishery Commission or to a Joint Expert Group, to avoid the possible overlapping of competences and advice.

STECF notes that the assumption of the 2007 catches in the catch projections undertaken in 2006 differs significantly for the realized catches in 2007. This brings into question the precision of the catch estimates as there is a risk that the stock size is overestimated in 2008 and subsequent years possibly leading to over optimistic catch estimates in the projections.

12.8. Southern Pacific albacore (*Thunnus alalunga*)

FISHERIES: The development of this fishery is relatively recent in comparison to many other tuna fisheries. Catches from Pacific Island countries have increased in recent years and accounted for 50% of the total longline catches in 2002.

After an initial period of small-scale fisheries development, annual catches of South Pacific albacore varied considerably and have recently been between about 60,000–70,000 t. The longline fishery harvested most of the catch, about 25,000–30,000 t per year on average, prior to about 1998. The increase in longline catch to

approximately 70,000 t in 2005 is largely due to the development of small-scale longline fisheries in Pacific Island countries. Catches from the troll fishery are relatively small, generally less than 10,000 t per year. The driftnet catch reached 22,000 t in 1989, but has since declined to zero following a United Nations moratorium on industrial-scale drift-netting.

Total catch in 2004 was about 55,000 t - less than the peak of 62,000 t obtained in 2002. Since the driftnet fishery ceased in 1991, most catches came from New Zealand and USA troll fleets south of 30°S and by longline fleets that operated in waters 10°-50° S. The catches reported by WCP in 2005 amounted to 58,188 t. Catches in 2006 in WCPO were about 58,000 t, but they are not clearly reported in the assessment. Total catches for 2007 reached 59,495 t (>75% obtained by longlines).

Note: The boundary of this stock was recently moved from 30°S to 25°S.

SOURCE OF MANAGEMENT ADVICE: While there is no specific advisory body for this species, Scientific Committee of the Western and Central Pacific Fisheries Commission has performed a comprehensive assessment of this stock in 2009.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: The 2009 assessment concluded that levels of stock size and *MSY* appear more realistic than in the 2008 assessment, because many sources of potential bias have been removed. However, uncertainty remains over a moderate range of biomass and fishing mortality levels. Models that down-weight the length frequency data (in order to rely on the index of abundance from the CPUE data), tend to give lower biomass relative to B_{MSY}, and higher fishing mortality relative to F_{MSY}, throughout the time series. There is considerable uncertainty about the early biomass trend, but this has negligible effect on the management parameters. Estimates of $F_{2005\text{-}2007}/F_{MSY}$ (from 0.1 to 0.5) and $SB_{2005\text{-}2007}/SB_{MSY}$ (from 1.7 to 4.9) are quite variable between model configurations, but the variation does not include overfishing, above F_{MSY}, or an overfished state below SB_{MSY}.

Most of the longline albacore catch is taken in a relatively narrow latitudinal band (10–40° S). The highest catch rates for albacore in the subequatorial area are relatively localised and limited to discrete seasonal periods, possibly associated with the northern and/or southern movements of fish during winter and/or summer. These peaks in seasonal catch rates tend to persist for a couple of months and to extend over a 10° latitudinal range. On this basis, it would appear that the main component of the longline exploitable biomass resides in a relatively small area, suggesting a modest stock size.

The results of the 2009 assessment suggest that regional stock depletion has contributed to catch rate declines, but localised depletion may also have contributed. Observed declines in catch rates from significant domestic longline fisheries (e.g. Fiji, French Polynesia, and Samoa) — following periods of relatively high albacore catch (3,000–10,000 t per year) — may indicate localised stock depletion (Langley 2004). Strong relationships may occur between catch rates and removals in the preceding 10 day period (Langley 2006). It is possible that movement rates into and out of EEZ's are lower than peak catch levels, and there is some viscosity (perhaps residency) in the population.

RECENT MANAGEMENT ADVICE: At a local scale, very high levels of fishing effort appear to be capable of causing localised depletion of albacore tuna. This is principally an issue for domestic longline fleets where fishing effort is concentrated in a relatively small area, largely due to operational constraints of the fleet. Indications from the Fijian, Samoan and French Polynesian longline fishery is that, on average, catch rates may be reduced by about 20% at high levels of fishing effort.

The model estimates that, in theory, increasing effort to F_{MSY} would yield somewhat more catch in the long term (equilibrium yield at current effort 63,000 mt; *MSY* 97,000 mt). However, higher yields at the current exploitation pattern of the fishery would require more fishing effort, resulting in lower adult biomass and lower longline catch rates. Thus, any consideration of management objectives and performance indicators for the South Pacific albacore fishery needs to also consider the economics of those longline fisheries targeting albacore in the region.

WCPFC, in 2005, adopted management measures, including a limitation on the number of fishing vessels to the current or recent historical (2000-2004) levels.

STECF COMMENTS: STECF notes that, again, the latest assessment indicates that increasing effort in areas of albacore concentration can result in a sudden drop in catch rater ('Strong relationships may occur between catch rates and removals in the preceding 10 day period). STECF therefore advises that catch rates and fishing effort should be closely monitored.

12.9. Black skipjack (Euthynnus alletteratus)

FISHERIES: Total catch in the EPO ranged from about 107 to 4,250 t, with the peak in 1993. Preliminary catch estimate for 2007 accounts for about 3,538 t, about 6% less than the previous year, confirming a slight decline since 2005. Almost all the catches (99%) are taken by purse-seiners (2,067 t retained and 1,434 t discarded). Data from other are Pacific Ocean areas are not available.

SOURCE OF MANAGEMENT ADVICE: It is unclear which management body is responsible for the management of this species in the Pacific Ocean (IATTC is provides management advice for the EPO).

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: No data.

RECENT MANAGEMENT ADVICE: No management advice.

STECF COMMENTS: STECF notes that data on this species should also be collected by the WCPFC.

12.10. Pacific bonito (*Sarda spp*.)

FISHERIES: This genus in the Pacific includes three species (*Sarda australis*, *S. chilensis* and *S. orientalis*), having different distributions and fisheries. Available fishery data however, probably only relate to two of these species and then only for a partial range of their distribution. Historical catch in the EPO ranged from about 26 to 14,227 t, with a previous peak in 1990. Total preliminary catch in 2007 was about 17,610 t, a new historical peak and about 5 times higher than the previous year. The 2007 catches are also 5 times higher than the average catch (3,622 t) in the last 20 years (1987-2006). Almost all the catches (about 93%) are provided by purse-seiners (15,680 t retained and 687 t discarded), however IATTC have noted that this species is also caught by artisanal fisheries and these catches are not reported. Preliminary 2008 catch estimates for the period to August 31 shows a strong reduction (-86%) compared to the same period in 2007.

SOURCE OF MANAGEMENT ADVICE: It is unclear which management body is taking care of this species in the Pacific Ocean, but IATTC is providing the management for the EPO.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: no data.

RECENT MANAGEMENT ADVICE: No management advice.

STECF COMMENTS: STECF notes the need for robust fishery data to support the provision of management advice for bonito in the Pacific and there is a need to collect data on catches from the WCPO and from artisanal fisheries throughout the whole pacific. There is also a need to investigate and explain the reasons behind the recently observed peak catches reported from the Pacific. STECF considers that the limited distribution of some species of bonito together with the growing demand for bonito for high quality canned products may require that the fishery for bonito in the Pacific is closely monitored.

12.11. Pacific swordfish (*Xiphias gladius*)

FISHERIES: Swordfish occur throughout the Pacific Ocean between about 50°N and 50°S. They are caught mostly by the longline fisheries of Far East and Western Hemisphere nations. Lesser amounts are taken by gillnet and harpoon fisheries. They are seldom caught by recreational fishermen. During the most recent three-year period the greatest catches in the eastern Pacific Ocean (EPO) have been taken by vessels of Spain, Chile, and Japan, which together harvest about 70% of the total swordfish catch taken in the region. All three have fisheries that target swordfish, though most of the swordfish taken in the Japanese fishery are incidental catches

of a fishery that targets predominantly bigeye tuna. Other nations with fisheries known to target swordfish are Mexico and the United States.

Swordfish tend to inhabit waters further below the surface during the day than at night, and they tend to inhabit frontal zones. Several of these occur in the EPO, including areas off California and Baja California, off Ecuador, Peru, and Chile, and in the equatorial Pacific. Swordfish tolerate temperatures of about 5° to 27°C, but their optimum range is about 18° to 22°C. Swordfish larvae have been found only at temperatures exceeding 24°C. The best available scientific information from genetic and fishery data indicate that the swordfish of the northeastern Pacific Ocean and the southeastern Pacific Ocean (south of 5°S) constitute two distinct stocks. Also, there may be movement of a northwestern Pacific stock of swordfish into the EPO at various times.
During the most recent three-year period the greatest catches in the EPO have been taken by vessels of Spain, Chile, and Japan, which together harvested about 72% of the total swordfish catch taken in the region. Of these three, Spain and Chile have fisheries that target swordfish, while swordfish taken in the Japanese fishery are incidental catches in a fishery that predominately targets bigeye tuna.

The average annual catch during 1998-2002 for the northern region has been about 4,800 t, and for the southern region about 9,100 t. Catches in the southern region have doubled during this period, reaching 13,300 t in 2002, which exceeded the previously-recorded high catch of 12,400 t reported in 1991. The average annual longline catch of swordfish during 1990-2004 was 10,000 t, but during 2001-2004 was about 16,000 t. It is not clear if this is due solely to increasing effort directed toward swordfish. Total swordfish catches in the EPO reached 19,726 t in 2002, decreasing to 18,520 t in 2003, 15,687 t in 2004, 13,290 t in 2005 and 12,712 t in 2006 of which 8.812 t were taken by longlines, 3,985 t by other gear while 5 t was discarded. Preliminary and largely incomplete catch reports in 2007 amount to only 601 t. It is to be noted that Spain alone reported to IATTC swordfish catches of 5,152 t in 2007 and these are clearly not included in the IATTC reported catch in the EPO. Total swordfish catch in WPO were 19,431 t in 2000, then dropping to 12,707 t in 2004 and 1,965 t in 2005 (provisional and incomplete by data). It is to be noted that Spain alone reported to WCPFC swordfish catches of 3,107 t in 2007 for the WPO. Catches in the SW and SC Pacific show a peak in 2003 at about 7,500 t, decreasing to about 7,100 t in 2004, 5,800 t in 2005, 6,200 t in 2006 and 6,100 t in 2007. Catches in various Pacific areas are reported only in number of fish.

SOURCE OF MANAGEMENT ADVICE: the advisory bodies are IATTC, ISC, WCPFC and SPC, without a clear distinction of competencies.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: The ISC's 2009 stock assessment of swordfish in the North Pacific Ocean was based on two different stock structure hypotheses: a single homogeneous stock in the North Pacific Ocean and two stocks (WCPO and EPO) in the North Pacific Ocean with little or no mixing between them, the latter of which is the preferred hypothesis because most of the stock structure evidence so far supports this hypothesis.

Results using the single stock hypothesis indicate that the MSY is 19,100 t and the exploitable biomass has been well above this MSY level. The estimated harvest rate has been well below the harvest rate of 34% at MSY. The harvest rate for 2006 was 13%.

With the two-stock hypothesis, the results for the WCPO stock indicate that the MSY is 14,400 t and the exploitable biomass has largely been above this MSY level for the entire time series of data. The estimated harvest rate at MSY is 26% and actual harvest rates have largely been below this level for the entire time series. In 2006, the harvest rate was 14%. Projecting this harvesting rate to 2010, results in the exploitable biomass continuing to remain above the biomass at MSY.

The ISC concluded that both stocks of swordfish in the North Pacific Ocean are healthy and well above levels required to sustain recent catches.

RECENT MANAGEMENT ADVICE: IATTC has not provided any management recommendations.

STECF COMMENTS: STECF is concerned that the growing international markets for swordfish may result in an increase in targeted fishing effort on swordfish in the Pacific. STECF advises that fisheries exploiting for swordfish in the Pacific should be closely monitored and all attempts to undertake more comprehensive assessments should be encouraged by the various Commissions concerned.

12.12. Pacific Blue Marlin (*Makaira nigricans*)

FISHERY: The best knowledge currently available indicates that blue marlin constitutes a single world-wide species, and that there is a single stock of blue marlin in the Pacific Ocean. For this reason, statistics on catches are compiled, and analyses of stock status are made, for the entire Pacific Ocean. Blue marlin are taken mostly by longline vessels of many nations that fish for tunas and billfishes between about 50°N and 50°S. Lesser amounts are taken by recreational fisheries and by various other commercial fisheries. Small numbers of blue marlin have been tagged, mostly by recreational fishermen, with conventional tags. A few of these fish have been recaptured long distances from the locations of release. In addition, blue marlin has been tagged with electronic tags and their activities monitored for short periods of time. Blue marlin usually inhabit regions where the sea-surface temperatures (SSTs) are greater than 24°C, and they spend about 90% of their time at depths in which the temperatures are within 1° to 2° of the SSTs.

Blue marlin are taken by longline vessels of many nations that fish for tunas and billfishes between about 50°N and 50°S. Lesser amounts are taken by recreational and sport fisheries and by various commercial surface fisheries. The fisheries in the EPO have historically captured about 10 to 18% of the total harvest of blue marlin from the Pacific Ocean (42,000 t in 2002), with captures in the most recent 5-year period averaging about 10% of the total harvest. The reported total catch in the EPO were 3,937 t in 2004, about 3,676 t in 2005 and 2,093 t in 2006. The preliminary catch estimate in 2007 is only about 136 t. Spain reported catches of 16.7 t in the WCP and 1.1 t in EPO in 2007.

SOURCE OF MANAGEMENT ADVICE: The advisory body is IATTC, but WCPFC and ISC also share competence.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: A production model was used to assess the status of the blue marlin stock of the Pacific Ocean. Data for the estimated annual total retained catches for 1951-1997 and standardized catches per unit of effort developed from catch and nominal fishing effort data for the Japanese longline fishery for 1955-1997 were used. It was concluded that the levels of biomass and fishing effort were near those corresponding to the maximum sustainable yield (MSY). A more recent analysis of data for the same years, but using MULTIFAN-CL, was conducted to assess the status of blue marlin in the Pacific Ocean and to evaluate the efficacy of habitat-based standardization of longline effort. There is considerable uncertainty regarding the levels of fishing effort that would produce the MSY. However, it was determined that blue marlin in the Pacific Ocean are close to fully exploited, i.e. that the population is near the top of the yield curve. It was also found that standardization of effort, using a habitat-based model, allowed estimation of parameters within reasonable bounds and with narrower confidence intervals about the estimates. A new assessment is planned in 2010.

RECENT MANAGEMENT ADVICE: No management advice.

STECF COMMENTS: STECF notes that quantities of billfish caught in the Pacific Oceans are still not reported by species. In addition, and many catches that are known to occur are not reported at all. The lack of reliable catch data is affecting the understanding of this stock and the management advice.

12.13. Pacific Striped Marlin (*Tetrapturus audax*)

FISHERY: Striped marlin occurs throughout the Pacific Ocean between about 45°N and 45°S. They are caught mostly by the longline fisheries of Far East and Western Hemisphere nations. Lesser amounts are caught by recreational, gillnet, and other fisheries. Catches in the WPO showed an increasing trend up to 1970, then a decreasing trend in recent years. Catches in WPO were 5,998 t in 2000, while incomplete reported catches dropped to 2,225 t in 2004 and 492 t in 2005; more recent catches are not available. Spain reported 0.27 t of striped marlin caught in the WCPO in 2007.
During recent years the greatest catches in the eastern Pacific Ocean (EPO) have been taken by fisheries of Costa Rica, Japan, and the Republic of Korea. Landings of striped marlin decreased in the EPO from 1990-1991 through 1998, and this decline has continued, with an average annual catch during 2000 to 2005 of about 1750 t (ranging between about 1,645 and 2,235 tons). There ported catches in the EPO in 2005 amount to 1,645 t and about 1,589 t in 2006 among the lowest historical catches in this area. The preliminary catch estimate for 2007 is only 140 t.

The principal recreational fisheries for striped marlin in the EPO operate within about 50 to 100 miles of the shores of Mexico. These are generally characterized as catch-and-release for all marlin species. Sport-fishing trips increasing from about 32,500 trips in the early 1990s to about 55,500 trips in recent years, with annual catches of striped marlin increasing from about 13,300 fish to about 30,000 fish over this period. A record high catch of about 58,000 individuals was taken in 2007, the most recent year for which complete data are available, and the preliminary estimate for 2008 is of the same magnitude.

Average release rate for the 1999-2007 period was about 77.4 percent (range: 72.4 to 82.5). Assuming 100 percent mortality of fish released, and the reported annual median weight of fish sampled, then the conservative estimate of average annual mortality resulting from the recreational fishery during 1990-2006 was about 195 t (range: 115 to 310), and the mortality associated with the record high catch in 2007 was about 545 t. At a mortality rate of about 25 percent (Domeier et al., 2003), the mortality in 2007 was about 140 t.

SOURCE OF MANAGEMENT ADVICE: Traditionally, the advisory body was IATTC, but currently both ISC and the WCPFC also deal with this species.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: The stock structure of striped marlin in the Pacific Ocean is not well known. Analyses of stock status made using two production models, taking into account the time period when billfish were targeted by longline fishing in the EPO, were considered the most plausible. A Pella-Tomlinson model yielded estimates of the average maximum sustained yield (A_{MSY}) in the range of 3,700 to 4,100 t, with a current biomass to be about 47% of the unfished biomass. The current biomass is estimated to be greater than the biomass that would produce the A_{MSY}. An analysis, using the Deriso-Schnute delay–difference model, yielded estimates of A_{MSY} in the range of 8,700 to 9,200 t, with current biomass greater than that needed to produce the A_{MSY} and about 70% of the size of the unexploited biomass.

The stock(s) of striped marlin in the EPO are apparently in good condition, with current and near-term anticipated fishing effort less than that required to produce the AMSY. The most recent analysis carried out by ISC indicates that the spawning biomass in the North Pacific in 2003 was estimated to be only 14-15% of the 1970 levels. The results of these assessments are considered provisional. According to WCPFC, several of the plausible model scenarios investigated indicate that current levels of fishing mortality may approximate or exceed the reference level F_{MSY} and current spawning biomass levels may approximate or be below the biomass based reference point B_{MSY}. A new assessment is planned in late 2008.

The information and results presented indicate that striped marlin population levels in the EPO are at or above the level expected to provide landings at MSY levels, which are currently estimated at about 3,300 to 3,800 t, substantially more than the current catch. There has been an observed decreasing trend in standardized fishing effort since about 1990-1991, and nominal fishing effort and catch have continued to decline since about 2001. There are indications that for the next few years the nominal fishing effort will continue near or below levels observed in recent years. Based on the information, analyses and hypotheses discussed and shown herein, it is considered that the striped marlin stocks in the EPO are in good condition, with cur-rent and near-term anticipated fishing effort less than F_{MSY}.

RECENT MANAGEMENT ADVICE: No management advice has been provided by IATTC (who believe that this stock is probably at or above the average MSY level). On the contrary, ISC has recommended that fishing mortality for striped marlin in the north Pacific should not be permitted to exceed current levels. The same measure was recommended by the Scientific Committee of the WCPFC for the area covered by that Commission. The WCPFC in 2008 decided that, for management purposes and with the goal to adopt the necessary conservation measures, the North Pacific striped marlin should be considered in the future as a separate stock and ISC should take care of its assessment. ISC adopted a conservation advice to reduce the fishing mortality from the current levels.

STECF COMMENTS: STECF notes that the advice arising from the IATTC and the WCPFC is based on incomplete data and provisional assessment results. STECF notes that quantities of billfish caught in the Pacific Ocean are still not reported by species and many catches known to occur are not reported at all. The lack of reliable catch data is affecting the understanding of this stock and the management advice.

12.14. Pacific Black Marlin (*Makaira indica*)

FISHERY: The Pacific Black Marlin is a by-catch mostly from the long-line fishery, but is a target species in some artisanal and recreational fisheries. Catches reached a peak of about 905 tons in 1973, decreasing in the following years. Total catch in the EPO from 1976 to 2006 ranged between 112 t to 621 t; the average catch in the period from 2000 to 2006 was about 185 t. The total catch in the EPO for 2006 is 177 t; a value about 26% higher than the 2005 catch. Preliminary catch estimates for 2007 reports about 91 t. EU-Spain in 2007 reported catches of 2.8 t in the WCPO end 0.2 t in the EPO.

SOURCE OF MANAGEMENT ADVICE: Traditionally, the advisory body was IATTC, but WCPFC, ISC and SPC are also competent.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: No recent stock assessments have been made for this species, although there are some data presented in the IATTC Bulletin series published jointly by scientists of the National Research Institute of Far Seas Fisheries (NRIFSF) of Japan and the IATTC that show trends in catches, effort, and CPUEs.

RECENT MANAGEMENT ADVICE: No management advice.

STECF COMMENTS: STECF notes that quantities of billfish caught in the Pacific Ocean are still not reported by species and many catches known to occur are not reported at all. The lack of reliable catch data is affecting the understanding of this stock and the management advice.

12.15. Pacific Shortbill Spearfish (*Tetrapturus angustirostris*)

FISHERY: The information in sections 11.15-11.17 was updated using resources available on the internet as provided by the advisory bodies relevant to these stocks. Since the most recent information that could be found on assessment of stock status and management advice was relating to 2007, it would appear that no new information ismay not be available.

The shortbill spearfish is occasionally taken as a by-catch in various fisheries or is as a target species in some artisanal or recreational fisheries. Reported catches in the EPO have increased were growing since 1994, reaching a peak of 304 tons in 2001. Recent catches are below this peak showing alternate values (274 t in 2002, 293 t in 2003, 208 t in 2004, 278 t in 2005 and 263 in 2006). The preliminary catch estimate in 2007 is only 2 tons. EU-Spain in 2007 reported very low catches, 0.1 t in the WCPO and <0.01 t in the EPO. No estimate for 2008 landings exists. Data from 2008 could not be found for Pacific shortbill spearfish in the EPO.

SOURCE OF MANAGEMENT ADVICE: The advisory bodies are IATTC, WCPFC, ISC and SPC..

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: There are no recent No recent stock assessments available for appear to have been made for this species, although there are some data presented in the IATTC Bulletin series published jointly by scientists of the National Research Institute of Far Seas Fisheries (NRIFSF) of Japan and the IATTC showing that show trends in catches, effort, and CPUEs.

RECENT MANAGEMENT ADVICE: No management advice.

STECF COMMENTS: STECF notes that quantities of billfish caught in the Pacific Ocean are still not reported by species and many catches known to occur are not reported at all. The lack of reliable catch data is affecting the understanding of this stock and the management advice.

12.16. Indo-Pacific Sailfish (*Istiophorus platypterus*)

FISHERY: Indo-Pacific sailfish is not uncommon among longline catches in the Pacific Ocean. Reported catches fluctuate considerably, reaching a peak of 2,323 tons in 1993. Between 1997 and 2002 catches in the EPO ranged from 1,241 to 1,848 tons. Recent catches are showing alternate values (1,270 t in 2003, 1,453 t in 2004, 860 t in 2005 and 769 t in 2006). The preliminary catch estimate in 2007 is 173 t.

SOURCE OF MANAGEMENT ADVICE: The advisory bodies are IATTC, WCPFC, ISC and SPC.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: No recent stock assessments have been carried outmade for this species, although there are some data presented in the IATTC Bulletin series published jointly by scientists of the National Research Institute of Far Seas Fisheries (NRIFSF) of Japan and the IATTC that show trends in catches, effort, and CPUEs.

RECENT MANAGEMENT ADVICE: No management advice.

STECF COMMENTS: STECF notes that quantities of billfish and sailfish caught in the Pacific Ocean are still not reported by species and many catches known to occur are not reported at all. The lack of reliable catch data is affecting the understanding of stock status and the management advice.

12.17. Indo-Pacific Marlins, Sailfish, Spearfish and Billfish (mixed species)

FISHERY: Billfish, marlins and sailfish species in the Indo-Pacific are very often reported together by the various Regional Fishery Commissions concerned, without a clear distinction among species, due to the poor statistics available. Reported catches in the EPO were growing up to a peak of 2,491 t in 2002, while recent catches are showing decreasing values (1,398 t in 2003, 1,393 t in 2004, 906 t in 2005 and 506 t in 2006). Preliminary catch estimates in 2007 are only 60 t. All billfish catches combined in the WCPAC are reported to be about 4,713 t in 2004, with an average of 5,816 t in the period 1998-2001. Spain in 2007 reported 0.5 t in the WCPO and 0.02 t in the EPO. Although information relating to landings, stock assessment or advice for 2008 could not be found for these species in the EPO, some information from the Indian Ocean was available from the IOTC Working Party on Billfish 2009 report. This stated that the 2008 catch information from the La Reunion fishery operating in the Indian Ocean was incomplete because of unreturned logbooks. Catches were comprised of 3% marlin, 1% sailfish, 1% spearfish. No significant changes had happened in the fleet since 2007 and the number of vessels operating had remained the same.

SOURCE OF MANAGEMENT ADVICE: The advisory bodies are IATTC, WCPAC, SPC, ISC and IOTC.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for these stocks.

STOCK STATUS: Not available

RECENT MANAGEMENT ADVICE: No management advice.

STECF COMMENTS: STECF remarks that these quantities of billfish, marlins, spearfish and sailfish caught in the Pacific Ocean are still not reported by species and many catches known to occur are not reported at all. The lack of reliable catch data is affecting the understanding of stock status and the management advice.

12.18. Pacific jack mackerel (*Trachurus symmetricus*)

FISHERY: The Pacific jack mackerel, *Trachurus symmetricus* (also known as the Californian jack mackerel or simply jack mackerel), is an abundant species of pelagic marine fish in the jack family, Carangidae. The species is distributed along the western coast of North America, ranging from Alaska in the north to the Gulf of California in the south, inhabiting both offshore and inshore environments. The Pacific jack mackerel is a moderately large fish, growing to a maximum recorded length of 81 cm, although commonly seen below 55 cm. It is very similar in appearance to other members of its genus, *Trachurus*, especially *Trachurus murphyi*, which was once thought to be a subspecies of *T. symmetricus*, and inhabits waters further south. Pacific jack mackerel travel in large schools, ranging up to 600 miles offshore and to depths of 400 m, generally moving through the upper part of the water column. Chilean (also known as Peruvian) jack mackerel (*Trachurus symmetricus murphyi*) is widespread throughout the South Pacific, from the shelf adjacent to Ecuador, Peru, and Chile; throughout the oceanic waters along the Subtropical Convergence Zone; in the New Zealand EEZ south of about 34S; and, in south-eastern waters of the Australian EEZ. From genetic studies it has been identified as a distinct species and supports one of the largest single-species fisheries in the world, with annual landings approaching 2.5 million tonnes (FAO, 2004). The fish aggregate in dense schools and layers, exhibit daily vertical migration, and feed on zooplankton associated with the upwelling areas off central-south Chile.

All species can be caught by bottom trawl, midwater trawl, or by purse seine targeting surface schools. Reported catches of Chilean jack mackerel (for FAO area 87) were 1.28 million tonnes in 1980, grew year-on-year to reach a peak of 4.96 million tonnes in 1995 and decreased thereafter to 1.5 million tonnes in 2000. Since then catches have averaged 1.7 million tonnes.

SOURCE OF MANAGEMENT ADVICE: The advisory body for the Chilean jack mackerel is the South Pacific Regional Fisheries Management Organisation.

PRECAUTIONARY REFERENCE POINTS: The South Pacific Regional Fisheries Management Organisation[14] has determined that, for the Chilean stock in 2005, a fishing mortality reference point of $F40\%_{BDR}$, F/Fref was 1.25. No precautionary reference points have been proposed for the other stocks.

STOCK STATUS:

The Chilean straddling stock is, at present, considered to be fully exploited. Given the moderate productivity of this species, caution with respect to any increases in fishing mortality is needed. For the other stocks, given the absence of current information, is not possible to provide detailed comment. However, given the moderate productivity of this species and the lack of information about current stock biomass levels, due caution is appropriate.

RECENT MANAGEMENT ADVICE: No management advice.

In 2007, the South Pacific Regional Fisheries Management Organisation noted that with the exception of Chilean vessels, there are no management measures in place for jack mackerel fisheries in the high seas (New Zealand and Australian vessels that may take this species as an occasional by-catch are regulated by a high seas permitting regime).

Due to the nature of the straddling Chilean stock, the same regulatory controls that apply within the Chilean EEZ also apply on the high seas: these controls include maximum catch limits per vessel owner and size limits.

STECF COMMENTS: STECF agrees with the advice provided by SPRFO.

13. Resources in the Antarctic

Resources in the Antarctic are managed under a convention administered by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR). CCAMLR member countries participated in 13 fisheries in the Convention Area during the 2008/09 season[15]. Up to 25 September 2009, reported total catches of targeted species were 123 948 tonnes of krill (*Euphausia superba*), 13 025 tonnes of toothfish (*Dissostichus* spp.) and 1 936 tonnes of icefish (*Champsocephalus gunnari*) . This review of Antarctic resources is based on the document SC-CAMLR-XXVIII (28th Report of the Scientific Committee 2009; www.ccamlr.org, publications) and CCAMLR-XXVIII (Draft report of the 28th meeting of the Commission. 26th October 2009-6th November 2009).

13.1. Toothfish (*Dissostichus* spp.)

The total catch of toothfish in the CCAMLR Convention Area during the 2007/08 season (up to the end of September 2009) was 13 025[16] t, compared to 15,592t for the whole of the 2007/08 season. Catches outside the Convention Area were 10 065 t up to the end of September 2009, compared with 12,682 t for the whole of the 2007/08 season. The estimated IUU catch for all subareas and divisions in the Convention Area was 938 tonnes. This was a reduction from 1,169t in 2007/08 and 3,615 t in 2006/07. With the exception of exploratory fisheries, toothfish are exploited under the conservation measures in two main areas: in the Atlantic Ocean Sector (Subareas 48.3 and 48.4), and the Indian Ocean Sector (Subareas 58.6 and 58.7 and Divisions 58.5.1 and 58.5.2).

[14] SPRFMO-III-SWG-16
[15] The CCAMLR fishing season runs from 1 December to 30 November.
[16] Provisional figure subject to update at the end of the fishing season.

13.1.1. Patagonian toothfish (*Dissostichus eleginoides)* in Subarea 48.3, South Georgia

FISHERIES: Longline fishing for *Dissostichus eleginoides* began in the early 1990s. Annual catches are in generally in the range 3,000 to 5,000 t. There was significant illegal fishing in the mid to late 1990s, exceeding the catch of the legal fishery in some years. There has been no significant IUU catch since the 2000/01 season. The total catch in the Subarea 48.3 in 2008/09 was 3,383 t.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is the CCAMLR. The assessment is based on an integrated assessment (CASAL) that uses catch at length, CPUE and tagging data. CASAL model structure and assumptions are detailed in the WG-FSA Report (2009). Assessments are now carried out biennially. The assessment in 2009 was used to set catch limits for two years; 2009/10 and 2010/11. The assessment will be updated at the 2011 meeting of WG-FSA.

PRECAUTIONARY REFERENCE POINTS: $SSB_{t+35years} >= 50\% SSB_0$; probability of SSB dropping below 20% of $SSB_0 <0.1$

STOCK STATUS: The stock in Sub area 48.3 is considered fully exploited. $SSB_{current} > 50\% SSB_0$

RECENT MANAGEMENT ADVICE: Long-term annual yield of 3,000 t.

STECF COMMENTS: STECF has no comments.

13.1.2. Patagonian toothfish (*Dissostichus eleginoides)* in Subarea 48.4, South Sandwich Islands

FISHERIES: Licensed longline vessels commenced fishing for D. eleginoides. in Subarea 48.4 in 1991/92 and 1992/93; fishing was abandoned following poor catches. For management and research purposes the fishery is divided into two parts: northern and southern (divided along 57o20'S). A tagging program was introduced in the Northern Area in 2004/05 and extended to the Southern Area in 2008/09. The total catch of *Dissostichus eleginoides* in the Subarea 48.4 in 2008/09 was 59 t in the Northern Area and 75 tonnes in the Southern Area. The fishery in the Northern Area was closed in 2008/09 when the bycatch limit of *macrourus* spp. was reached. The catch in the Southern Area was for research purposes only.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is CCAMLR. The assessment is based on an integrated assessment (CASAL) that uses catch at length, CPUE and tagging data. CASAL model structure and assumptions are detailed in the WG-FSA Report (2009). The assessment in 2009 was used to set catch limits for two years; 2009/10 and 2010/11. A single CASAL assessment model was used for an assessment of D. eleginoides in the Northern Area of Subarea 48.3. Long term yield that satisfies the CCAMLR decision rules was 41 tonnes.

PRECAUTIONARY REFERENCE POINTS: $SSB_{t+35years} >= 50\% SSB_0$; probability of SSB dropping below 20% of $SSB_0 <0.1$.

STOCK STATUS: The stock in the Northern Area of Subarea 48.3 is considered to be fully exploited. The status of the stock in the Southern Area is unknown and subject to a research fishing plan.

RECENT MANAGEMENT ADVICE: The catch limit for the Northern Area is 41 tonnes. A catch limit of 75 tonnes for research purposes is in place for the Southern Area. Further tagging of fish during the 2009/10 season will contribute to a new assessment of the fishery.

STECF COMMENTS: STECF has no comments.

13.1.3. Patagonian toothfish (*Dissostichus eleginoides)* in Subareas 58.6 and 58.7 Prince Edward and Marion Islands

FISHERIES: A licensed fishery within the South African EEZ at the Prince Edward Islands started in October 1996. Part of the South African EEZ is outside the CAMLR Convention Area (Area 51) and part falls within

Subareas 58.6 and 58.7 and Division 58.4.4. Very large IUU catches, over 7000 tonnes (1996/97) were taken in the late 1990s. The total catch taken in the South African EEZ in 2008/09 season was 4 tonnes, taken by longlines.

SOURCE OF MANAGEMENT ADVICE: The fishery in the waters adjacent to Prince Edward and Marion Islands is managed by the Republic of South Africa. Subarea 58.6 also includes the Crozet Islands to the east of the Prince Edward Islands.

PRECAUTIONARY REFERENCE POINTS: Assessment of appropriate levels of future catch have not been based on the CCAMLR decision rules.

STOCK STATUS: An assessment was reviewed by CCAMLR in 2007. No new assessment was carried out in 2009.

RECENT MANAGEMENT ADVICE: Advice from CCAMLR is that an assessment based on CCAMLR decision rules should be developed. No new information was available on the state of fish stocks in Subareas 58.6 and 58.7 and Division 58.4.4 outside areas of national jurisdiction. This portion of these Subareas and Division is closed to fishing for *D. eleginoides.*

STECF COMMENTS: STECF has no comments.

13.1.4. Patagonian toothfish (*Dissostichus eleginoides)* in Subarea 58.6, Crozet Islands

FISHERIES: A fishery for *Dissostichus eleginoides* operates in the French EEZ around the Crozet Islands in Subarea 58.6. Very large IUU catches, up to nearly 12,000 tonnes (1996/97) were taken in the late 1990s. The total catch of *Dissostichus eleginoides* in 2008/09 in the Subarea 58.6, in the waters adjacent to Crozet Islands was 746t to October 2008. The estimated IUU catch was 0 tonnes in 2008/09, down from 153 tonnes in 2007/08.

SOURCE OF MANAGEMENT ADVICE: The fishery inside the EEZ of the Crozet Islands is managed by France. CCAMLR provides general management advice, for Subarea 58.6. No new information was available to the CCAMLR Scientific Committee in 2008.

PRECAUTIONARY REFERENCE POINTS: Assessment of appropriate levels of future catch have not been based on the CCAMLR decision rules.

STOCK STATUS: No formal stock assessment has been carried out for Subarea 58.6. Tagging has been carried out since 2006.

RECENT MANAGEMENT ADVICE: Advice from CCAMLR is that biological parameters should be estimated and a stock assessment should be developed. Areas of high bycatch should be avoided. No new information was available on the state of fish stocks in Subarea 58.6 outside the area of national jurisdiction. This portion of the Subarea is closed to fishing for *D. eleginoides.*

STECF COMMENTS: STECF has no comments.

13.1.5. Patagonian toothfish (*Dissostichus eleginoides)* in Division 58.5.1, Kerguelen Islands

FISHERIES: A fishery for *Dissostichus eleginoides* operates in the French EEZ around the Kerguelen Islands in Division 58.5.1. Very large IUU catches, of over 7,000 tonnes (1997/98) were taken in the late 1990s and early 2000s. The total catch of *Dissostichus eleginoides* in Division 58.5.1 in 2008/09 was 3 108t (up to 31 August 2008). The estimated IUU catch was 0 tonnes, down from 489tonnes in 2007/08.

SOURCE OF MANAGEMENT ADVICE: The fishery inside the EEZ of the Kerguelen Islands is managed by France. CCAMLR provides general management advice for Division 58.5.1. No new information was available to the CCAMLR Scientific Committee in 2008.

PRECAUTIONARY REFERENCE POINTS: Assessment of appropriate levels of future catch have not been based on the CCAMLR decision rules

STOCK STATUS: No formal stock assessment has been carried out for Division 58.5.1.

RECENT MANAGEMENT ADVICE: Advice from CCAMLR is that biological parameters should be estimated and a stock assessment should be developed. Areas of high bycatch should be avoided. No new information was available on the state of fish stocks in Division 58.5.1 outside the area of national jurisdiction. This portion of the Subarea is closed to fishing for *D. eleginoides.*

STECF COMMENTS: STECF has no comments.

13.1.6. Patagonian toothfish (*Dissostichus eleginoides*) in Subarea 58.5.2, Heard and McDonald Islands

FISHERIES: In Division 58.5.2, the fishery for *Dissostichus eleginoides* was a bottom trawl fishery from the 1996/97 to the 2001/02 season. In recent seasons the fishery has been prosecuted by both trawlers and longliners. Some fishing with pots also occurs. The longline fishery was active from May to September 2009 and the bottom trawl fishery was active throughout the whole season. The total catch of *Dissostichus eleginoides* in Subarea 58.5.2 was 2 177 t for the period from Dec. 2008 until Oct. 2009 (the season close on 30 Nov. 2009).

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is CCAMLR. There is also a 200 mile EEZ around Heard and McDonald Islands administered by Australia. Assessments are now carried out biennially. The assessment is based on an integrated assessment using CASAL for combined sex, single-area, and a three-season model. CASAL model structure and assumptions are detailed in the WG-FSA Report (2007). The assessment in 2009 was used to set catch limits for two years; 2009/10 and 2010/11.

PRECAUTIONARY REFERENCE POINTS: $SSB_{t+35years} >= 50\% SSB_0$; probability of SSB dropping below 20% of $SSB_0 < 0.1$

STOCK STATUS: The stock in Subarea 58.5.2 is considered fully exploited.

RECENT MANAGEMENT ADVICE: Long-term annual yield of 2,550 t.

STECF COMMENTS: STECF has no comments.

13.1.7. Toothfish (*Dissostichus* spp.) Exploratory Fishery in Subarea 48.6

FISHERIES: The longline fishery for *Dissostichus* spp. in Subarea 48.6 began as a new fishery in 1996/97. Large IUU catches were taken in the late 1990s. Licensed longline vessels have undertaken exploratory fishing for *Dissostichus* spp. since 2003/04. In 2008/09 two vessels fished in the area south of 60°S with a total catch of 189 tonnes.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is CCAMLR.

PRECAUTIONARY REFERENCE POINTS: The fishery is currently conducted as a CCAMLR Exploratory Fishery. Catch limits are therefore set at a level not substantially above that necessary to obtain the information specified in the Exploratory Fishery's Data Collection Plan.

STOCK STATUS: Unknown

RECENT MANAGEMENT ADVICE: The Exploratory Fishery will continue in 2009/10 under the precautionary catch limit for *Dissostichus* spp. Of 200 tonnes north of 60°S and 200 tonnes south of 60°S.

STECF COMMENTS: STECF has no comments.

13.1.8. Toothfish (*Dissostichus* spp.) Exploratory Fishery in Division 58.4.1

FISHERIES: Licensed longline vessels have fished the exploratory fishery for *Dissostichus* spp. in Division 58.4.1 since 2004/05, and the target species is *D. mawsoni.* The reported total catch in 2008/09 up to October 2008 was 222 tonnes of *Dissostichus* spp. The IUU catch in 2008/09 was estimated to be 152 t. pa.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is CCAMLR.

PRECAUTIONARY REFERENCE POINTS: The fishery is currently conducted as a CCAMLR Exploratory Fishery. Catch limits are therefore set at a level not substantially above that necessary to obtain the information specified in the Exploratory Fishery's Data Collection Plan.

STOCK STATUS: Unknown

RECENT MANAGEMENT ADVICE: The precautionary catch limit for *Dissostichus* spp. was 210 tonnes in 2008/09. Exploratory fishing will continue in 2009/10 under the same precautionary catch limit.

STECF COMMENTS: STECF has no comments.

13.1.9. Toothfish (*Dissostichus* spp.) Exploratory Fishery in Division 58.4.2

FISHERIES: Licensed longline vessels have fished the exploratory fishery for *Dissostichus* spp. in Division 58.4.2 since 2003/04, and the target species is *D. mawsoni* . In 2008/09, there was a total catch of 66 tonnes of *Dissostichus* spp. Out of a precautionary catch limit of 70 tonnes. Approximately 799 tonnes of *Dissostichus* spp. were taken during IUU fishing in Division 58.4.2 between 2002/03 and 2006/07. There was no evidence of IUU fishing in 2007/08, but it was estimated that 176 tonnes were taken by IUU fishing in 2008/09.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is CCAMLR.

PRECAUTIONARY REFERENCE POINTS: The fishery is currently conducted as a CCAMLR Exploratory Fishery. Catch limits are therefore set at a level not substantially above that necessary to obtain the information specified in the Exploratory Fishery's Data Collection Plan.

STOCK STATUS: Unknown

RECENT MANAGEMENT ADVICE: The precautionary catch limit for *Dissostichus* spp. was 70 tonnes in 2008/09. Exploratory fishing will continue in 2009/10 under the same precautionary catch limit.

STECF COMMENTS: STECF has no comments.

13.1.10. Toothfish (*Dissostichus* spp.) Exploratory Fishery in Division 58.4.3a

FISHERIES: Licensed longline vessels have fished the exploratory fishery for *Dissostichus* spp. in Division 58.4.3a since 2004/05, and the target species is *D. eleginoides*. In 2008/09 the total catch was 31 tonnes of *Dissostichus* spp. out of a total precautionary catch limit of 86 tonnes. There was no evidence of IUU fishing in this division in 2008/09. Approximately 98 tonnes of *Dissostichus* spp. were taken during IUU fishing in 2004/05, and there were no reports of sightings or landings related to IUU fishing in 2005/06, 2006/07 and 2007/08.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is CCAMLR.

PRECAUTIONARY REFERENCE POINTS: The fishery is currently conducted as a CCAMLR Exploratory Fishery. Catch limits are therefore set at a level not substantially above that necessary to obtain the information specified in the Exploratory Fishery's Data Collection Plan.

STOCK STATUS: Unknown

RECENT MANAGEMENT ADVICE: The catch limit for Division 58.4.3a for the 2008/09 fishing year was 86 tonnes. Exploratory fishing will continue in 2009/10 under the same precautionary catch limit.

STECF COMMENTS: STECF has no comments.

13.1.11. Toothfish (*Dissostichus* spp.) Exploratory Fishery in Division 58.4.3b

FISHERIES: Licensed longline vessels have fished the exploratory fishery for *Dissostichus* spp. in Division 58.4.3b since 2003/04, and the target species is *D. mawsoni*. In 2008/09, the total catch was 104 tonnes of *Dissostichus* spp. out of a total precautionary catch limit of 120 tonnes. The estimated IUU catch of *Dissostichus* spp. in 2008/09 was 610 tonnes. In 2004/05 and 2005/06 the IUU catch exceeded 1 000 tonnes, and in 2006/07 it exceeded 2 000 tonnes. In 2007/08 it was estimated at approximately 246 tonnes.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is CCAMLR.

PRECAUTIONARY REFERENCE POINTS: The fishery is currently conducted as a CCAMLR Exploratory Fishery. Catch limits are therefore set at a level not substantially above that necessary to obtain the information specified in the Exploratory Fishery's Data Collection Plan.

STOCK STATUS: depleted

RECENT MANAGEMENT ADVICE: In 2008/09, the precautionary catch limit for *Dissostichus* spp. was 120 tonnes. There is no commercial TAC in 2009/10, but there is a scientific research survey planned with a total catch limit of 72 tonnes.

STECF COMMENTS: STECF has no comments.

13.1.12. Toothfish (*Dissostichus* spp.) Exploratory Fisheries in Subareas 88.1 and 88.2 (Ross Sea)

FISHERIES: The Ross Sea fishery saw a steady expansion from 1997/98 to 2000/01, a slight drop in 2001/02, followed by an increase in 2002/03, and an almost three-fold increase in effort in 2003/04. In 2004/05 and 2005/06, overall effort in the Ross Sea dropped, but increased again in 2006/07. In 2006/07, ice conditions resulted in some restrictions on fishing in the southern part of the area. The catch in 2008/09 was 2 434 t in Subarea 88.1 and 484 t in Subarea 88.2. The estimated IUU catch was zero in both Subareas. In Subarea 88.1 the IUU catch was 92 tonnes in 2001/02, 240 tonnes in 2003/04, 23 tonnes in 2004/05 and 187 tonnes in 2007/08. IUU catches in Subarea 88.2 have been much less (15 tonnes in 2005/06).

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is CCAMLR. The assessment is based on an integrated assessment (CASAL) that uses catch at age by sex, CPUE and tagging data. CASAL model structure and assumptions are detailed in the WG-FSA Report (2007 and 2008).

PRECAUTIONARY REFERENCE POINTS: $SSB_{t+35years} >= 50\% SSB_0$; probability of SSB dropping below 20% of $SSB_0 < 0.1$

STOCK STATUS: The stocks in Subareas 88.1 and 88.2 are considered fully exploited. $SSB_{current} > 50\% SSB_0$

RECENT MANAGEMENT ADVICE: The catch limits for the 2009/10 season are 2 850 tonnes and 575 tonnes in Subareas 88.1 and 88.2 respectively.

STECF COMMENTS: STECF has no comments.

13.2. Antarctic Icefish (Chamsocephalus gunnari)

13.2.1. Antarctic icefish (*Chamsocephalus gunnari*), Subarea 48.3, South Georgia

FISHERIES: A trawl fishery targeting groundfish, including *Champsocephalus gunnari* has operated in Subarea 48.3 since the late 1960s. *C. gunnari* has been the dominant species in the catch since 1980/81. Catches peaked at 128,000 tonnes in 1982/83. There was virtually no fishery during the 1990s. Since 1999 the catch has been in the region of 2000 to 4000 tonnes annually. The catch in 2008/09 was 1 837 t. The fishery now utilises exclusively pelagic and semi-pelagic trawls. There has been no evidence of IUU fishing activity in this fishery.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is CCAMLR. Advice is based on a single short term (2 year) Generalised Yield Model (GYM) projection of age 2+ using survey-derived estimates of current biomass. A new survey was undertaken in January 2009.

PRECAUTIONARY REFERENCE POINTS: $SSB_{t+2years} >= 75\% SSB_{current}$

STOCK STATUS: Stock level is highly variable and dependent on recruitment. A responsive management strategy, using a short term (2 year) assessment approach based on the results of groundfish surveys has been used since 2000.

RECENT MANAGEMENT ADVICE: The catch limits for *C. gunnari* are 1 548t in 2009/10 and 949t in 2010/11. The latter catch limit may be revised in November 2010 based on the results of a new survey to be undertaken in January 2010. The annual fishing season is now 1 December to 30 November.

STECF COMMENTS: STECF has no comments.

13.2.2. Antarctic icefish (*Chamsocephalus gunnari*), Division 58.5.2, Heard and McDonald Islands

FISHERIES: A pelagic and semi-pelagic trawl fishery targeting *Champsocephalus gunnari* has operated in Division 58.5.2 since the late 1970s. Historical catches peaked at 15,200 tonnes in 1976/77. There was virtually no fishery during the early 1990s. Catches fluctuate depending on recruitment. The catch in 2007/08 was 199 t. There has been no evidence of IUU activity in this fishery.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is CCAMLR. Advice was based on a single short term (2 year) Generalised Yield Model (GYM) projection of age 2+ using survey-derived estimates of current biomass.

PRECAUTIONARY REFERENCE POINTS: $SSB_{t+2years} >= 75\% SSB_{current}$

STOCK STATUS: Stock level is highly variable and dependent on recruitment. A responsive management strategy, using a short term (2 year) assessment approach based on the results of groundfish surveys has been used since 2000. There is evidence of cyclic behaviour in adult population size, with a peak in the fishery every three years.

RECENT MANAGEMENT ADVICE: The aggregate two year catch will be taken in one year, followed by a one year closure. The catch limit for *C. gunnari* is therefore 1 658 in 2009/10 and 0t in 2010/11.

STECF COMMENTS: STECF has no comments.

13.3. Lantern fish (*Electrona carlsbergi*), Subarea 48.3, South Georgia

FISHERIES: The last year in which there were catches from *E. Carlsbergi* fishery was 1991/92 (51,865 t). There was no reported catch of lantern fish in this area in 2008/09.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is CCAMLR. The fishery has not been assessed since 1994.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: The state of the stock was last assessed in 1994. A precautionary catch limit has been set at 109 000 t . Since the average life span of this species is about five years, the 1994 assessment is no longer applicable. CCAMLR closed the fishery on this species in 2003.

RECENT MANAGEMENT ADVICE: Due to the lack of new information on the current status of the stock, CCAMLR has agreed that the fishery will remain closed until a new survey on this species is conducted and results have been evaluated by the Scientific Committee.

STECF COMMENTS: STECF has no comments.

13.4. Krill (*Euphausia superba*)

The krill fishery operated only in Area 48 during the 2007/08 season. Six vessels from five member nations fished. The total catch was 125 063 t. Nine countries have submitted notifications for 18 vessels in the 2008/09 season. A notification for an exploratory krill fishery in Subarea 48.6 was also received.

13.4.1. Krill (*Euphausia superba*) Area 48

FISHERIES: The total catch of krill in the 2008/09 season, was 123 948 t. The catch was taken from Subareas 48.1 and 48.1 Less than 1 tonne was taken from Subarea 48.3 (South Georgia), which has previously been an important area for the krill fishery, particularly in winter when areas further south are less accessible due to ice cover. The winter catch in Subareea 48.2 was significantly higher than average, hence despite the lack of catch from South Georgia, the overall total catch was very similar to 2007/08.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is CCAMLR. Advice on the overall catch limit is based on a long term (10 year) Generalised Yield Model projection using survey-derived estimates of current biomass and recruitment variability. An integrated assessment method has been proposed as alternative assessment methods. CCAMLR has also recognised the need address the spatial overlap between krill dependent land-based predators and the commercial krill fishery. Since the demise of the distant water fleet of the former Soviet Union, fishing for krill has been more concentrated in coastal areas where krill concentrations are more easily located.

PRECAUTIONARY REFERENCE POINTS: $SSB_{t+35years}$ >= 75% SSB_0; probability of SSB dropping below 20% of SSB_0 <0.1.

STOCK STATUS: Revised B_0=37.29 million tonnes.

RECENT MANAGEMENT ADVICE: Under conservation measure 51-01 (2007) the total catch of krill in Area 48 is limited to 3.47 million t with a trigger level of 620,000t. The trigger level cannot be exceeded until the Commission has defined an allocation of this total catch limit between small scale management units, as defined by the Scientific Committee. At the 2009 meeting, the Commission took a step in this direction by agreeing an interim distribution of the catch between Subareas 48.1, 48.2, 48.3 and 48.4, based on percentages of the trigger level; 25%, 45%, 45% and 15% respectively. The percentages include some overlap to accommodate variability in the location of the fishery between subareas.

STECF COMMENTS: STECF has no comments.

13.4.2. Krill (*Euphausia superba*), Subarea 48.6

FISHERIES: There was no catch of krill in this area in. 2008/09. An exploratory fishery was notified by one CCAMLR Member for the 2009/10 season.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is CCAMLR.

PRECAUTIONARY REFERENCE POINTS: $SSB_{t+35years}$ >= 75% SSB_0; probability of SSB dropping below 20% of SSB_0 <0.1.

STOCK STATUS: Unknown

RECENT MANAGEMENT ADVICE: The catch limit proposed under Conservation Measure 51-05 (2009) for the Exploratory Fishery is 15,000t of which no more than 11 250t shall be taken from within 60n miles of known breeding colonies of land-based dependent predators.

STECF COMMENTS: STECF has no comments.

13.4.3. Krill (*Euphausia superba*), Division 58.4.1

FISHERIES: There was no catch of krill in this area in. 2008/09.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is CCAMLR.

PRECAUTIONARY REFERENCE POINTS: $SSB_{t+35years}$ >= 75% SSB_0; probability of SSB dropping below 20% of SSB_0 <0.1.

STOCK STATUS: A survey in the region (1996) provided a B_0 estimation of 4.83 million t (will be revised using new protocols).

RECENT MANAGEMENT ADVICE: The catch limit proposed under Conservation Measure 51-02 (2006) is 440,000 t.

STECF COMMENTS: STECF has no comments.

13.4.4. Krill (*Euphausia superba*), Division 58.4.2

FISHERIES: There was no catch of krill in this area in 2008/09.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is CCAMLR.

PRECAUTIONARY REFERENCE POINTS: $SSB_{t+35years}$ >= 75% SSB_0; probability of SSB dropping below 20% of SSB_0 <0.1.

STOCK STATUS: Revised B_0=12.46 million tonnes.

RECENT MANAGEMENT ADVICE: Under conservation measure 51-03 (2007) the total catch of krill is limited to 1.488 million t with a trigger level of 260,000 t west 55ºE and 192,000 t east 55ºE.

STECF COMMENTS: STECF has no comments.

13.5. Antarctic squid (*Martialia hyadesi*), Subarea 48.3, South Georgia

FISHERIES: There has been no fishery for squid (*Martialia hyadesi*) since 2002/03, and no new request has been submitted to CCAMLR to continue exploratory fishing for this species in 2009/10.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is CCAMLR.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: Unknown; unexploited.

RECENT MANAGEMENT ADVICE: The fishery is now closed until such time as a new notification for an exploratory fishery is received by CCAMLR.

STECF COMMENTS: STECF has no comments.

13.6. Crabs (*Paralomis spinosissima* and *Paralomis formosa*), Subareas 48.3 (South Georgia), 48.2 (South Orkneys) and 48.4 (South Sandwich Islands),

FISHERIES: Stone crabs (*Paralomis* spp.) were exploited briefly during the 1990s in Subarea 48.3. There has been no fishery since 2002/03. Russia has notified its intention to conduct a fishery for crabs in Subarea 48.3 during the 2009/10 season, including exploratory fishing in Subareas 48.2 and 48.4.

SOURCE OF MANAGEMENT ADVICE: The main management advisory body is the CCAMLR.

PRECAUTIONARY REFERENCE POINTS: No precautionary reference points have been proposed for this stock.

STOCK STATUS: Unknown; unexploited.

RECENT MANAGEMENT ADVICE: The catch limit in Subarea 48.3 is 1,600 tonnes. Proposed limits for the exploratory fishery are 250 tonnes for Subarea 48.2 and 10 tonnes for Subarea 48.4. An experimental harvest regime shall apply throughout the fishery.

STECF COMMENTS: STECF has no comments.

14. Proposed designation of a Marine Protected Area in CCAMLR sub-area 48.2

Background

The Commission aims to propose designation of Marine Protected Area in CCAMLR sub-area 48.2, more specifically, to the south of the South Orkney Islands, for the consideration of CCAMLR Plenary.

The region surrounding the South Orkney Islands has been previously identified by CCAMLR as one of 11 priority areas in which work to establish spatial protection should be focused.

At the last Working Group on Ecosystem Monitoring and Management (WG EMM), the UK presented a paper "Towards a System of Marine Spatial Protection for the South Orkney Islands". The WG EMM agreed that the data used in this paper have been used appropriately and that the analyses are likely to yield a conservative and unbiased estimate of target areas for MPAs in the South Orkney Islands region. WG EMM therefore recommended that the Scientific Committee consider these results and any extension to the analysis in the paper to identify MPAs in Subarea 48.2 for inclusion of representative system of MPAs. The preliminary report of the WG EMM is attached.

The Scientific Committee meeting will be held just before the CCAMLR Plenary and we expect it to elaborate on the findings of this paper. CCAMLR is a unique organisation due to its ecosystem approach and it is managing a very fragile ecosystem. It has the competence to declare closed areas, closed seasons and can also impose prohibition of certain fishing activities in certain areas. Most recently, the performance review Panel called on CCAMLR to take a more proactive role with respect to the designation of MPAs.

Request to STECF

STECF is requested to advise on this proposed management option and its possible impacts on stocks distributed within CCAMLR Subarea 48.2.

Scientific papers, the report of last and the previous years' meetings of the CCAMLR Scientific Committee can be found on this publicly available website: http://www.ccamlr.org/pu/E/e_pubs/sr/drt.htm

STECF Observations

STECF reviewed the paper entitled “Preliminary proposal for marine spatial protection around the South Orkney Islands” (Annex III). The paper describes the application of conservation planning methodology (Margules & Pressey, 2000) together with Marxan reserve selection software (Game & Grantham, 2008) to

identify a number of candidate pelagic areas of conservation importance across the South Orkney Islands region based on conservation objectives defined for the region.

Four key areas of conservation importance were identified, each of which meet as far as possible, all of the defined conservation objectives for the minimum cost in terms of area or other costs such as existing fishing use.

The preliminarily proposed marine protected area (MPA) was selected by applying three design rules, based on those used by Lombard et al. (2007) in the development of a MPA around the Prince Edward Islands, to the Marxan analysis output. The design rules were as follows:

1. Minimize the area required to meet the objectives
2. Avoid overlap of proposed protected areas with current fishing activities where choices exist, but do not compromise biodiversity targets.
3. Use practical boundaries, e.g. by using straight lines, and exact degrees and minutes where possible.

STECF notes that the data and analyses used in the selection of the proposed preliminary MPA appear appropriate to identify candidate areas for MPAs in the South Orkney Islands region.

STECF notes that although four main areas were identified by the Marxan analysis as having high conservation value, the preliminarily proposed MPA (Figure 13.1) was prioritized as a candidate area for protection, because of its predictable importance for penguin foraging.

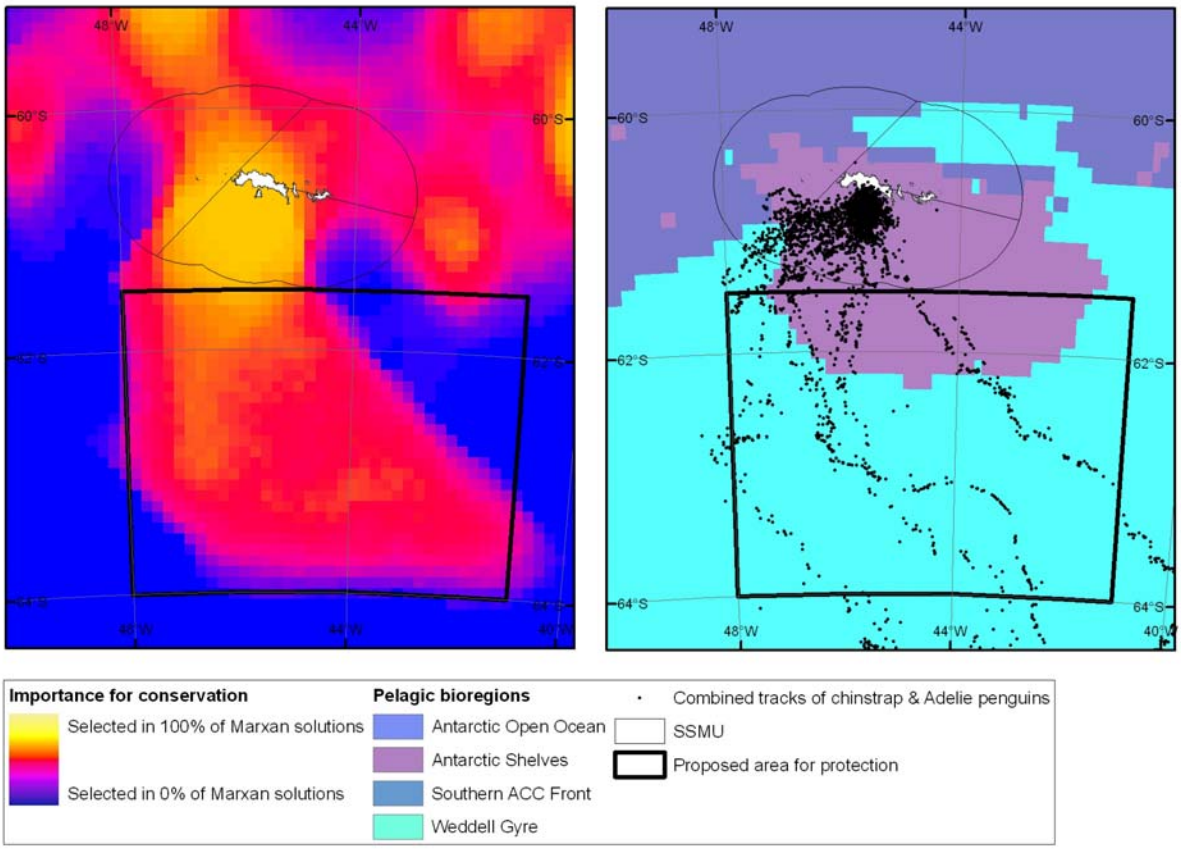

Figure 13.1. Left panel: Preliminary area proposed for spatial protection (thick black line) in the southeastern sector of Subarea 48.2, with the Marxan output shown in the background; Right panel: pelagic bioregions and combined tracks of chinstrap and Adelie penguins occurring within the proposed area for protection and the existing SSMUs (thin black line).

STECF also notes that proposed preliminary area has minimal overlap with current and proposed fishing activities within Subarea 48.2, and includes only one fine-scale rectangle in which krill fishing has taken place in the past (Figure 13.2). It also includes two of the fine-scale rectangles identified as part of the operational area for the experimental harvest of crabs All of Subarea 48.2 is currently closed to fin-fishing (CM 32-03, 1998), so the proposed MPA would not affect any other fisheries.

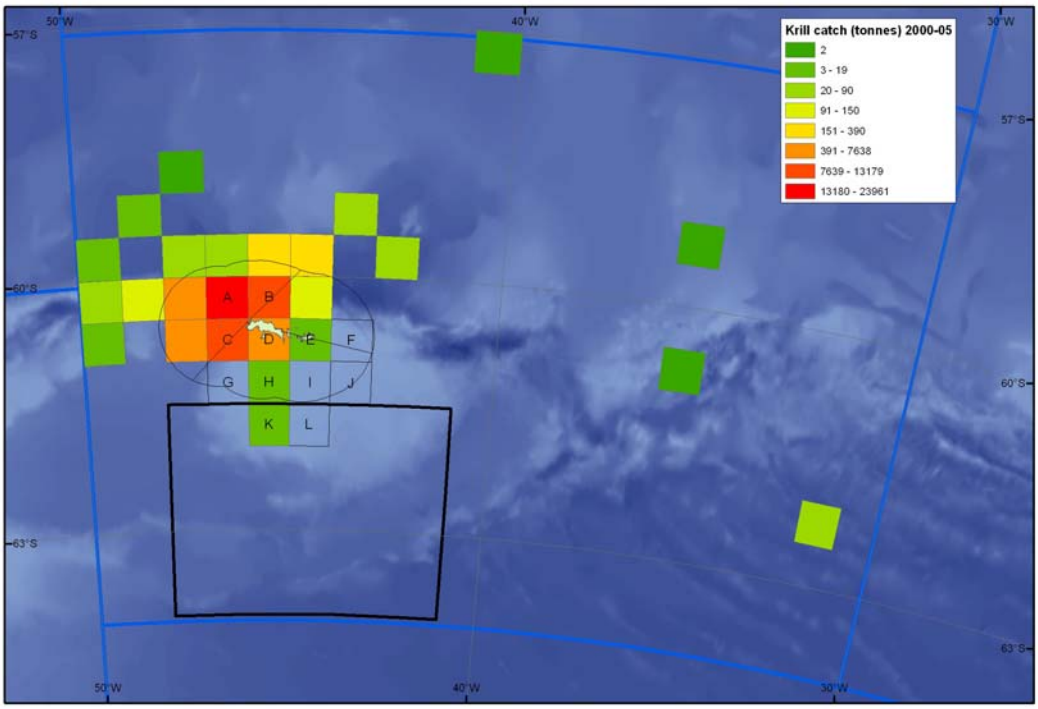

Figure 13.2. Location and extent of the krill fishery in Subarea 48.2 from 2000 to 2005 (data from CCAMLR Statistical Bulletin, 2006), showing total catches within each fine-scale rectangle during this period. Fine-scale rectangles with letters A to L show the operational area for phase I of the experimental harvest regime for the crab fishery (WG-FSA Report 2008, Figure 2). The existing SSMUs (thin black line) and proposed candidate area for protection (black box) is also shown.

STECF Conclusion

Given that the methodology to identify candidate MPAs in CCAMLR Subarea 48.2 and that the design rules used to select the preliminary MPA seem appropriate, STECF agrees that the area identified is a sensible candidate for a MPA in CCAMLR Subarea 48.2. Noting that finfish fishing is prohibited in Subarea 48.2 and that the overlap between the proposed MPA and existing and proposed fisheries is minimal STECF concludes that the impacts on fishing activities and fish stocks in the area are likely to be negligible.

15. List of Acronyms

ACOM	The Advisiory Committee of ICES
ACFM	The Advisory Committee on Fishery Management
ALADYM	Age-Length Based Dynamic Model
ASPM	Age structured population model
BRP	Biological Reference Points
CCAMLR	Committee for the Conservation of Antarctic Marine Living resources
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
CECAF	Committee for Eastern Central Atlantic Fisheries
CITES	Convention on International Trade on Endangered Species
CNR	National Council of Research (Italy)
CPFD	Catch per fishing day
CPS	Commission du Pacifique Sud
CPUE	Catch per unit effort
CTMFM	Comisión Técnica Mixta del Frente Marítimo
DEPM	Daily egg production method
DFO	Department of Fisheries and Oceans
EIAA	Economic Interpretation of the ACFM Advice
EIFAC	European Inland Fishery Advisory Committee
EEZ	Exclusive economic zone
EPO	Eastern Pacific Ocean
F	Fishing mortality
FAO	Fisheries and Agriculture Organization
FAD	Fishing Attracting Device
FARWEST	Fisheries Assessment Research in Western Mediterranean
FIGIS	Fisheries Geographical Information System
FICZ	Falkland Island Inner Conservation Zone
FIFD	Falkland Islands Fisheries Department
FISHSTAT	FAO Fisheries Statistics
FOCZ	Falkland Island Outer Conservation Zone
FRCC	Fisheries Resources Conservation Committee
FU	Functional Units
GFCM	General Fisheries Commission for the Mediterranean
GRUND	GRUppo Nazionale Demersali (Italy)
GSA	Geographical Sub Area
HCMR	Hellenic Centre for Marine Research
IATTC	Inter American Tropical Tuna Commission
IBSFC	International Baltic Sea Fisheries Commission
ICA	Integrated catch at age analysis
ICCAT	International Commission for Conservation of Atlantic Tuna
ICES	International Council for the Exploration of the Sea
ICS	International Scientific Committee for Tuna and Tuna-like species in the North Pacific Ocean
IFREMER	Institut Français de Recherche pour l'Exploitation de la Mer
IEO	Instituto Español de Oceanografía
INIDEP	Instituto Nacional de Investigación y Desarrollo Pesquero
IOTC	Indian Ocean Tuna Commission
ISMAR	Institute of Marine Science (Italy)
IUCN	International Union for Conservation of Nature
IUU	Illegal, Unregulated and Unreported
LCA	Length-based cohort analysis
LLUCET	Project to study the recruitment and juveniles of hake
LPUE	Landings per unit effort
MBAL	Minimum biologically acceptable level
MEDITS	International Bottom Trawl Surveys in the Mediterranean

MEDLAND	Mediterranean Landings
MSY	Maximum sustainable yield
MSVPA	Multi Species VPA
NAFO	Northwest Atlantic Fisheries Organisation
NEA	North East Atlantic
NEI	Not Elsewhere Included
NEMED	*Nephrops* in Mediterranean Sea
NRIFSF	National Research Institute for Far Seas Fisheries - Japan
PA	Precautionary Approach
PICTs	Pacific Islands Countries and Territories
PO	Pacific Ocean
RRAG	Renewable Resources Assessment Group
SAC	Scientific Advisory Committee (GFCM)
SAFC	South Atlantic Fisheries Commission
SAGP&A	Secretaria de Agricultura, Ganadería, Pesca y Alimentos (Argentine)
SCRS	ICCAT Standing Committee on Research and Statistics
SCSA	Sub-Committee on Stock Assessment (GFCM)
SCTB	Standing Committee on Tuna and Billfish (western and central Pacific Ocean)
SGMED	Subgroup on the Mediterranean
SGRST STECF	Subgroup on Resource Status
SPC	Southern Pacific Commission
SSB	Spawning stock biomass
SSB/R	Spawning stock biomass per recruit
STECF	Scientific, Technical and Economic Committee for Fisheries
SURBA	Survey Based Assessment (software)
TAC	Total Allowable Catch
WCPO	Western Central Pacific Organisation
WCPFC	Western Central Pacific Fishery Organisation
WECAF	Committee for Western Central Atlantic Fisheries
WGEF	Working Group on Elasmobranches Fishes
WIO	Western Indian Ocean
WP	IOTC Working Parties
WPB	IOTC Working Parties on Billfish
WPTT	IOTC Working Parties on Tropical Tunas
WPO	Western Pacific Ocean
XSA	Extended survivors analysis
Y/R	Yield per recruit

16. Reference

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17. Annex I Contact details of Participants

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18. Annex II-Expert declarations

Declarations of invited experts are published on the STECF web site on https://stecf.jrc.ec.europa.eu/home together with the final report.

19. Annex III – Preliminary proposal for marine spatial protection around the South Orkney Islands

SC-CAMLR-XXVIII

Working Paper

Agenda Item: **3(ii)**

Original: **English**

PRELIMINARY PROPOSAL FOR MARINE SPATIAL PROTECTION AROUND THE SOUTH ORKNEY ISLANDS

Submitted by the United Kingdom

PRELIMINARY PROPOSAL FOR MARINE SPATIAL PROTECTION AROUND THE SOUTH ORKNEY ISLANDS

Working Paper submitted by the United Kingdom

ABSTRACT

This paper proposes the establishment of a protected area to the south of the South Orkney Islands (within Subarea 48.2), to contribute towards the conservation of marine biodiversity and the development of representative marine spatial protection for this region. The proposed area has been selected on the basis of analysis previously recommended by WG-EMM for consideration by the Scientific Committee (WG-EMM-09 Report, paragraph 5.23). The paper describes the processes used to identify areas of conservation importance and the selection of candidate sites for protection. In addition, the paper discusses the need for further work required to achieve a comprehensive, adequate and representative network of marine protected areas within Subarea 48.2 and across the Southern Ocean, as previously agreed by the Scientific Committee (SC-CAMLR-XXVII, paragraph 3.55).

The paper invites the Scientific Committee to:

i) Endorse the work undertaken to date and recommend the adoption of a protected area (covering the region marked in Figure 3) contributing towards the conservation of marine biodiversity in Subarea 48.2 (South Orkney Islands), for which special use restrictions including a prohibition on fishing but allowing activities such as some scientific research (to be further elaborated by the Commission) would apply;

ii) Recommend to the Commission that further intersessional work be undertaken in relation to the additional areas of conservation importance identified in this paper, with a view to finalising any further proposals for specific areas for protection around the South Orkney Islands at CCAMLR-XXIX;

iii) Discuss procedures for implementing the type of marine spatial protection proposed in this paper.

1. INTRODUCTION

This paper describes recent work towards the development of marine spatial protection and management in Subarea 48.2 (South Orkney Islands), and proposes a preliminary marine area to be considered for special protection. The South Orkney Islands are within one of the 11 priority areas identified by CCAMLR as regions in which further work to identify marine areas for protection should be focused (CCAMLR-XXVII Report, paragraph 7.2). Previous papers submitted by the United Kingdom to WG-EMM described a pilot study undertaken to test the utility of the systematic conservation planning methodology (WG-EMM-08/49), and preliminary outcomes using this methodology that can be used to inform decision-making on marine spatial protection (WG-EM-09/22). Systematic conservation planning was endorsed by the Scientific

Committee (SC-CAMLR-XXVII, paragraph 3.55) and the Committee on Environmental Protection (CEP XII Report, paragraph 193) as one of a range of possible approaches for the selection of marine areas for protection. In 2009, WG-EMM agreed that the analyses presented in WG-EMM-09/22 are likely to yield a conservative and unbiased estimate of target areas for protection in the South Orkney Islands region (WG-EMM 2009 Report, paragraph 5.23).

Following the recommendations of WG-EMM (WG-EMM 2009 Report, paragraphs 5.23-5.24), further work has been undertaken to extend the analyses undertaken in WG-EMM-09/22, and to identify preliminary areas for protection and management in Subarea 48.2. Although the focus of this paper is on the South Orkney Islands region, it is intended to be used as a working example to illustrate approaches that could be utilised more widely in the establishment of spatial protection and management in other parts of the Sothern Ocean.

Further work is required to refine the benthic analysis presented in WG-EMM-09/22, and updates to this work will be made available as soon as possible. In particular, recent work to identify VMEs in this region identified several areas that did not overlap with the initial benthic areas selected by our analysis as important for conservation (WG-EMM-09/32 and VME Workshop Report, Figure 2). The inclusion of this type of additional data on patterns of biodiversity will be important in refining the benthic analysis.

2. SELECTION OF CANDIDATE SITES FOR PROTECTION IN SUBAREA 48.2

2.1 Setting conservation objectives

The systematic conservation planning process is based on the definition of conservation objectives, which provide guidance on what is to be achieved by the implementation of protection or management measures. Objectives can be set in a hierarchical manner, with overarching goals being elaborated into more detailed or focused objectives for specific regions, ecosystems, activities or species, as required. Using broad objectives set at the highest level, more specific goals can be elaborated by quantifying the amounts of a particular feature, or the level of representation of certain habitats, which should be included in the protected area system.

The objective of CCAMLR is the conservation of marine living resources, including rational use (CCAMLR, Article II). Under this overarching goal, CCAMLR highlighted the conservation of biodiversity and the maintenance of ecosystem processes as its primary objectives with regard to marine protected areas (MPAs Workshop Report 2005, paragraph 61). The MPAs Workshop further specified that attention may need to be given to the need for, *inter alia*, protection of: i) representative areas, ii) scientific areas, iii) vulnerable areas, and iv) areas where important ecosystem processes occur (MPAs Workshop Report, paragraph 62). Additional objectives based on the requirements of Annex V of the Protocol on Environmental Protection, and experience from protected area planning elsewhere in the world should also be considered. Figure 1 displays this hierarchy of objectives, which was used to define specific regional objectives for marine conservation around the South Orkney Islands.

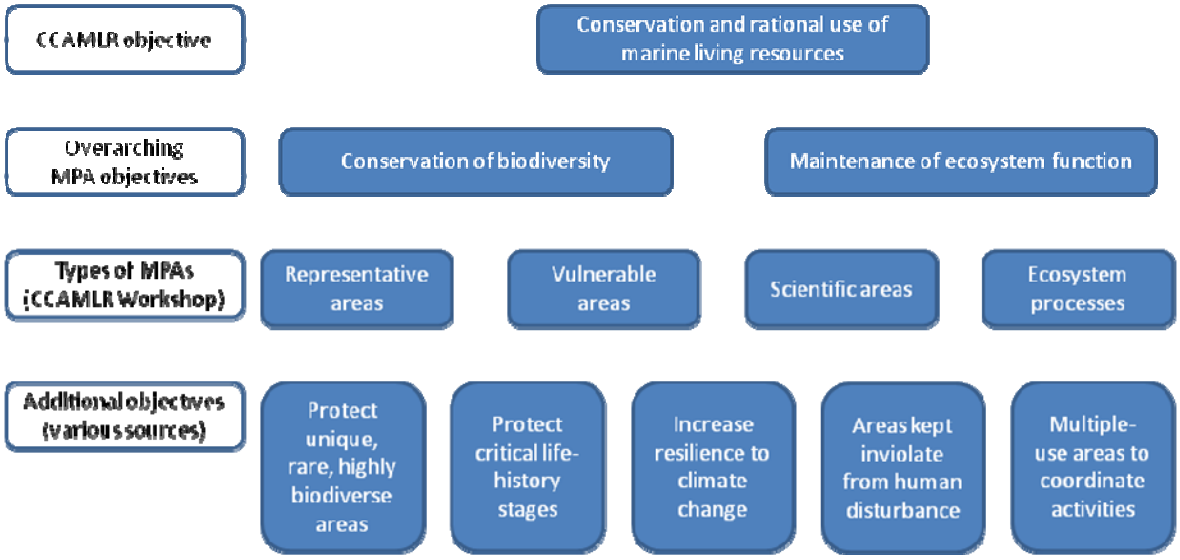

Figure 1: Hierarchy of conservation objectives, from the overarching goal specified in CCAMLR Article II, to the more specific objectives set out by the CCAMLR Workshop on MPAs (2005) and the Protocol on Environmental Protection.

Regional conservation objectives for the waters surrounding the South Orkney Islands were defined as part of the pilot study and subsequent work (WG-EMM-08/41 and WG-EMM-09/22), and are based on the general objectives listed in Figure 1. These guide the selection of important areas within the systematic conservation process, by quantifying each of the relevant goals based on information describing patterns of diversity, ecosystem processes and other features in the region. In order to provide a measure of importance, a proportional value is defined, i.e. "how much of a particular feature should be included". For a common feature, planners might consider that including a small amount (in terms of area) of the total distribution of that feature is sufficient to ensure its protection. However for a rare, unique or sensitive feature, a higher value might be used.

Table 1 shows the datasets and conservation objectives used in the pelagic analysis (see WG-EMM-09/22 for more detailed descriptions of each dataset). Some additional data have been incorporated (subsequent to analyses described in WG-EMM-09/22) to improve the information on frontal systems and penguin foraging ranges. For each dataset we set objectives based on values typically used in conservation planning elsewhere. For example, 10% was used as the target value for pelagic bioregions, corresponding to the lower range of similar targets used in conservation planning elsewhere. Similarly, values of 20% were used for predator foraging areas, to encompass larger areas for species which are highly mobile and less predictable in their distribution. Sensitivity analyses using a range of different values showed that the core areas selected by Marxan remained very similar when the proportional targets were increased. These sensitivity analyses thus showed that our selection of conservation objects were robust. However, it should be noted that these values are used simply to guide decision making, and do not constrain the final outcome which could be greater than, or less than, the target, depending upon practical considerations and other information.

Table 1: Descriptions of pelagic datasets and conservation objectives

Dataset	No. features	Description of features	Source	Specific regional objective for MARXAN analysis	Relevant conservation objectives from those listed in Figure 1
Albatross and petrel density	1	Combined data for 6 species: Wandering albatross (*Diomedea exulans*), light-mantled sooty albatross (*Phoebetria palpebrata*), grey-headed albatross (*Thalassarche chrysostoma*), black-browed albatross (*T. melanophrys*), white-chinned petrel (*Procellaria aequinoctialis*) and southern giant petrel (*Macronectes giganteus*)	Birdlife International Procellariiform Tracking Database (Birdlife, 2004)	20% of total area in which this feature occurs	- CONSERVATION OF BIODIVERSITY - CRITICAL LIFE HISTORY STAGES - RESILIENCE TO CLIMATE CHANGE - VULNERABLE AREAS
Penguin foraging ranges	3	- Adélie penguin (*Pygoscelis adeliae*) - Chinstrap penguin (*P. antarctica*) - Combined penguin species	British Antarctic Survey data; Lynnes et al., 2002	20% of each foraging range polygon	- CONSERVATION OF BIODIVERSITY - CRITICAL LIFE HISTORY STAGES - RESILIENCE TO CLIMATE CHANGE - VULNERABLE AREAS
Pelagic bioregions	4	4 bioregions: - Southern ACC front - Antarctic shelves - Antarctic open ocean - Weddell Gyre	CCAMLR Bioregionalisation Workshop (2007)	10% of each pelagic bioregion	- REPRESENTATIVE AREAS
Sea ice concentration	4	4 categories describing the mean proportion (0-1) of the year for which the ocean is covered by at least 15% sea ice)	Hobart Bioregionalisation Workshop (2006), Australian Antarctic Data Centre	10% of each sea ice concentration category	- REPRESENTATIVE AREAS - ECOSYSTEM PROCESSES
Chlorophyll-*a* concentration	1	1 category describing mean summer surface concentration	Hobart Bioregionalisation Workshop (2006), Australian Antarctic Data Centre	10% of total area in which this feature occurs (corresponds to 20% of summed chlorophyll concentration)	- REPRESENTATIVE AREAS - ECOSYSTEM PROCESSES - SCIENTIFIC AREAS
Ocean fronts	2	2 categories defining the mean position of ocean fronts: - sACCf (50 km buffer)	British Antarctic Survey; Thompson et al, 2009	10% of each frontal buffer zone	- REPRESENTATIVE AREAS - ECOSYSTEM PROCESSES - SCIENTIFIC AREAS

- sbACC (50 km buffer)

2.2 Review of existing protection and management

To identify whether and how the defined conservation objectives are being met, and to assist with planning additional protection and management measures, it is important to identify any existing protected or managed areas designated within the region. A basic gap analysis was undertaken to investigate whether the full range of conservation objectives outlined in Figure 1 is currently met by the existing protected and managed areas in the South Orkney Islands region (Table 2). It was concluded that there remain significant gaps in the achievement of these objectives.

The geographic coverage of protected areas in the South Orkney Islands region is currently poor. Both of the existing ASPAs with marine components lie within the Antarctic Shelves bioregion, and extend less than 3 km offshore. These areas represent examples of coastal and nearshore ecosystems, however they make very little contribution towards the objectives of a representative network of protected areas for all major marine ecosystems in this region. With the exception of the (not yet effective) SSMUs in Subarea 48.2, there are no marine spatial protection or management measures established in offshore pelagic areas.

ASPA No. 109 (Moe Island) and ASPA No. 111 (Southern Powell Island) are designated to protect large concentrations of breeding seabirds. This high diversity of predator species is therefore given some protection on land, but there are no areas established at sea to achieve the same objective. Pelagic species are very mobile and their distribution at sea is often unpredictable. However, foraging kernels based on seabird tracking data (e.g. Birdlife et al., 2006), ocean frontal systems and areas of high productivity are likely to capture some of these high diversity areas.

Maintenance of some ecosystem processes (e.g. predator foraging) could be achieved if subdivided catches for SSMUs were agreed, ensuring that localised impacts on predators were avoided. However, these areas would not necessarily include other ecosystem processes such as primary production or upwelling and frontal zones, and additional offshore areas may be required to fully achieve this objective.

Two specific issues of vulnerability are addressed by current spatial protection and management. CM 32-03 (1998) prohibits fin-fishing (other than for scientific research purposes) throughout Subarea 48.2, until such time as a survey of stock biomass is carried out and a decision is made by the Commission that the fishery should be reopened. Fish stocks in this region would be vulnerable to overexploitation if fin-fishing was permitted in the absence of such data on stock sizes. On a much smaller scale, the site guidelines adopted by the ATCM for visitors to Shingle Cove provide protection for vulnerable breeding birds (particularly burrowing and cliff-nesting petrels). The vulnerability of other areas may need to be considered in relation to the krill fishery or other human activities. In particular, the inclusion in the VMEs registry of the areas proposed in WG-EMM-09/32 would strengthen protection for benthic habitats. Consideration may also be given to how a precautionary approach might address the overlap between VME clusters and areas notified for the experimental harvest regime for crabs (VME Workshop Report, paragraphs 5.48 to 5.50).

Table 2: Achievement of conservation objectives through existing protection and management measures in place in the South Orkney Islands region

CONSERVATION OBJECTIVE	**CM 32-03 (1998) Prohibition of all fishing for finfish in 48.2**	**[Catch allocation in SSMUs – *not yet effective*]**	**ASPA No. 109 Moe Island**	**ASPA No. 111 Southern Powell Island**	**ASPA No. 114 Northern Coronation Island**	**ATCM Visitor Site Guidelines for Shingle Cove**
Conservation of biodiversity	✓	[✓]	✓ (terrestrial)	✓ (terrestrial/ nearshore)	✓ (terrestrial/ nearshore)	
Maintenance of ecosystem function		[✓]				
Representative areas			✓ (terrestrial)	✓ (terrestrial/ nearshore)	✓ (terrestrial/ nearshore)	
Vulnerable areas						✓ (terrestrial)
Scientific reference areas			✓ (terrestrial)		✓ (terrestrial/ nearshore)	
Important ecosystem processes		[✓]				
Unique / rare areas						
High biodiversity			✓	✓		
Increase resilience to climate change		[✓]				
Areas kept inviolate from human disturbance					✓ (terrestrial/ nearshore)	
Multiple-use areas to coordinate activities						

Any measures which reduce or minimise the direct impacts of human activities on species or habitats will contribute towards the objective of increasing the resilience of those features to the effects of climate change. Although it is unlikely that the effects of climate change can be mitigated altogether, the removal of other pressures will provide the best chance of recovery from climate-related impacts. For example, predators may have a better chance of withstanding a year of low food availability if they are able to forage in an area where prey is not being additionally depleted by a commercial fishery. With the exception of the (not yet effective) SSMUs in Subarea 48.2, there are no marine spatial protection or management measures established in offshore pelagic areas to address the overarching objective of the conservation of marine biodiversity, or any of the other objectives listed in Table 2.

2.3 Identifying areas of conservation importance

The analysis of whether and how the conservation objectives are being achieved through existing protection and management measures shows that there remain significant gaps in the achievement of the entire range of objectives set out in Figure 1. The next stage in the systematic conservation planning process is therefore to identify areas which can be given appropriate protection or management to fill those gaps.

Previous work using the conservation planning methodology (Margules & Pressey, 2000) together with Marxan reserve selection software (Game & Grantham, 2008) identified a number of pelagic areas of conservation importance across the South Orkney Islands region (WG-EMM Report, Figure 5). These areas are based on conservation objectives defined for the region, and the full methodology is described in detail in WG-EMM-08/49 and WG-EMM-09/22. Preliminary benthic areas for conservation were also identified (WG-EMM-09/22), although further work is required to extend the benthic analysis.

The outputs generated by Marxan highlight areas which meet all of the defined conservation objectives as far as possible, for the minimum cost in terms of area (or in terms of other 'costs' such as existing fishing use). The areas selected most often over a large number of Monte Carlo repeats of the analysis are considered to have the highest importance for conservation. The Marxan output for the pelagic environment around the South Orkney Islands (Figure 2) identifies four key areas of conservation importance. The shelf area surrounding the island group and extending to the south is important for primary production and penguin foraging. The offshore areas to the east, north, and northeast of the islands are areas of similarly high productivity with importance for albatross and petrel foraging in both winter and summer. The northern parts of these offshore areas also overlap with the region in which two frontal systems (the southern Antarctic Circumpolar Current front and the southern boundary of the Antarctic Circumpolar Current) occur close together. Such oceanographic features are predictable and important foraging locations for a range of predator species (Rodhouse et al., 1996; Bost et al., 2009). These four regions also incorporate representative examples of each of the four pelagic bioregions (Southern ACC Front, Antarctic Shelves, Antarctic Open Ocean, and Weddell Gyre), as well as a range of sea ice conditions which are likely to have different influences on ecosystem processes and biodiversity (Brierley & Thomas, 2002; Murphy et al., 2007).

The areas identified in the analysis do not represent a definitive 'solution' to the question of where protected areas should be located, but they provide a useful starting point to inform further discussion and decision-making. Other information on practical feasibility, and biological or environmental features not captured in the spatially continuous datasets used by Marxan must be considered alongside these outcomes in order to select candidate areas for protection and management.

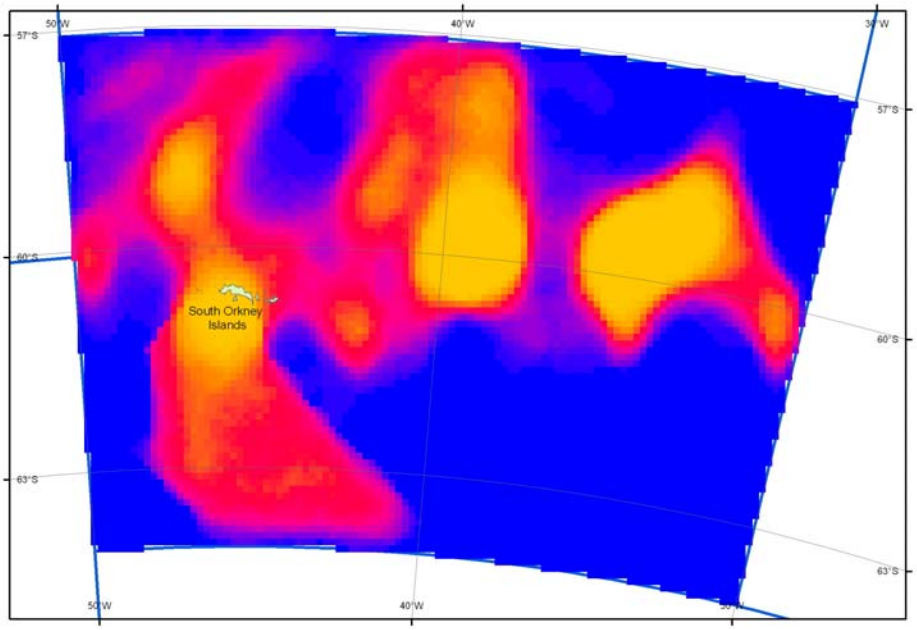

Figure 2: Output from Marxan showing the selection frequency of planning units within Subarea 48.2, when analysis was run 100 times based on the input data and conservation objectives described in Table 2. Planning units selected most frequently (orange/pink areas) are considered to have the highest importance for conservation, based on the defined conservation objectives.

2.4 Process for selecting areas for protection and management

Once the Marxan outputs have been generated using agreed input data and conservation objectives, they can be used to assist in decision-making regarding the selection of areas for protection and management. Not all of the areas identified by Marxan will be proposed as areas for protection or management. Similarly, areas that were not included in the Marxan output may still be proposed for protection for other reasons; for example to protect unique features that were not captured by the Marxan input data, or to allow an area with straight boundaries to be proposed for practical reasons. The type of protection or management proposed may vary across different areas, depending on the specific conservation requirements of individual areas. For example, a closed area may be more appropriate for offshore areas important for albatross foraging, whereas an ASPA designation might be proposed for a nearshore habitat of special scientific interest (see WG-EMM-09/09 for a discussion of how the range of different protection and management tools available under CCAMLR and the ATCM can be applied to deliver specific conservation objectives).

Additional information on biological and physical/environmental features was used alongside Marxan outputs to investigate whether and how features that had not been captured by the Marxan input datasets corresponded to the selected regions (see Appendix I for data maps). These maps include information on small-scale frontal systems and currents (Thompson et al., 2009), and penguin colony locations and sizes (Ratcliffe & Trathan, in prep). Information on human activities was also added to facilitate considerations of practical management and

protection measures, including locations of research stations and tourist landing sites, historic krill fishing locations and notified exploratory pot fishery locations. Scientific activities are concentrated around the research stations on Signy Island and Laurie Island, although there has also been extensive marine sampling on the shelf to the south of the islands in recent years (Barnes et al., 2008; Lockhart & Jones, 2008). In 2009, 11 areas in Subarea 48.2 were proposed for inclusion in the VMEs registry, based on information from research bottom trawls and *in situ* photographic/video observations during the 2006 and 2009 US Antarctic Marine Living Resources program surveys (WG-EMM-09/32).

A comprehensive Geographic Information System (GIS) has been established to manage the information associated with marine spatial protection and management in the South Orkney Islands region. This includes all of the datasets used in the original Marxan analysis, as well as information that has been incorporated subsequently, together with baseline information such as coastlines and bathymetry. Such a database is critical for managing information, visualising results and allowing a range of datasets to be easily brought together and overlaid.

The Marxan output (Figure 2) and additional data (maps in Appendix I) were used to select core regions for protection which would represent some of the four pelagic bioregions, as well as capturing major ecosystem processes such as ocean fronts, different ice conditions, and highly productive areas. Three design rules were employed, based on those used by Lombard et al. (2007) in the development of a marine protected area around the Prince Edward Islands:

1. Minimise the area required to meet the objectives
2. Avoid overlap of proposed protected areas with current fishing activities where choices exist, but do not compromise biodiversity targets.
3. Use practical boundaries, e.g. by using straight lines, and exact degrees and minutes where possible.

2.5 Proposed areas for protection

Following these design rules, a preliminary area for protection is proposed in the region to the south of the South Orkney Islands, in the southwest sector of Subarea 48.2 (Figure 3 and Table 3). This area encompasses examples of two of the pelagic bioregions in Subarea 48.2, as well as a significant proportion of penguin foraging areas to the south of the islands. Productive areas on the shelf edge, important benthic shelf habitats, and a range of different sea ice conditions are also included in the proposed area.

Although additional areas were also highlighted by the Marxan analysis as having high conservation importance, this proposal focuses on a single preliminary candidate area, in order to allow for consideration by the Scientific Committee of appropriate processes for review and designation. Within Subarea 48.2, predators foraging from the South Orkney Islands have a high priority for conservation, particularly in the context of current and potential future pressures such as fishing, climate change and other human activities. Among those identified in the Marxan analysis, this area was therefore prioritised as a candidate area for protection, because of its predictable importance for penguin foraging.

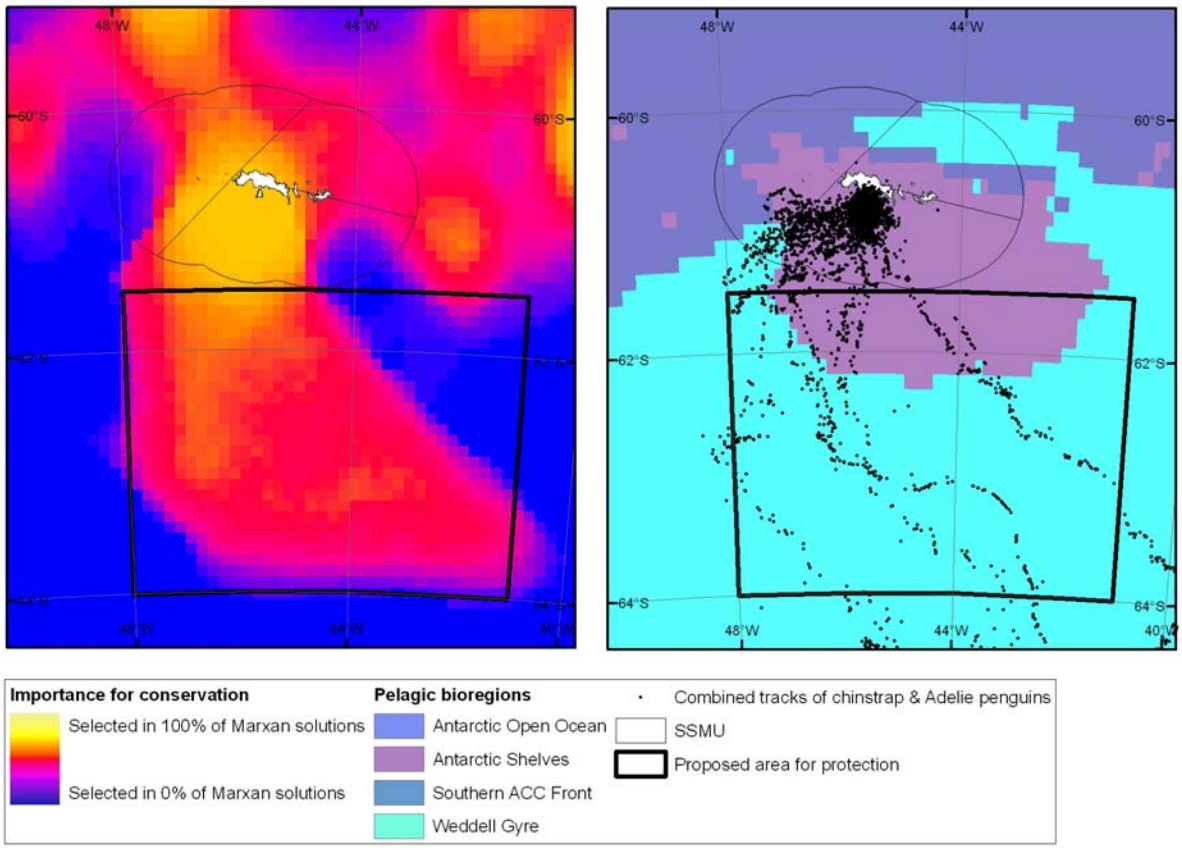

Figure 3: **Left panel:** Preliminary area proposed for spatial protection (thick black line) in the southeastern sector of Subarea 48.2, with the Marxan output (from Figure 2) shown in the background; **Right panel:** pelagic bioregions and combined tracks of chinstrap and Adelie penguins occurring within the proposed area for protection and the existing SSMUs (thin black line).

Table 3: Description of the preliminary area proposed for spatial protection in Subarea 48.2.

Candidate area	Pelagic / benthic	Features & values	Bioregions	% of Subarea 48.2	Proposed provisions	Proposed designation
	Pelagic & benthic	High productivity, predator foraging (especially Adelie & chinstrap penguins), seamount ridges and important benthic habitat	Weddell Gyre; Antarctic Shelves	11%	- Closed to all benthic and pelagic fishing. - Scientific research for long-term monitoring allowed. - No restriction on navigation.	Closed area for special protection

The proposed preliminary area for protection meets some of the defined conservation objectives (e.g. representation of two of the bioregions in Subarea 48.2), but it does not capture all of the planning units included in the Marxan 'best' solution, and other objectives such as inclusion of albatross and petrel foraging areas have not been met.

The proposed preliminary area has minimal overlap with current and proposed fishing activities within Subarea 48.2, and includes only one fine-scale rectangle in which krill fishing has taken place in the past (see Appendix I, map 4). It also includes two of the fine-scale rectangles identified as part of the operational area for the experimental harvest of crabs (WG-FSA Report 2008, Figure 2, and Appendix I, map 4). All of Subarea 48.2 is currently closed to fin-fishing (CM 32-03, 1998), so these proposed designations would not affect any other fisheries.

The Marxan analysis highlighted the shelf region around the South Orkney Islands as an area of high conservation importance, particularly for predator foraging and high levels of productivity, and to ensure representation of the Antarctic Shelves bioregion. SSMUs have been defined in this region for management of the krill fishery; however subdivided catch limits to prevent localised depletion of krill for predators in this region have yet to be determined. Additional spatial protection has not been proposed in the shelf area at this stage because of the ongoing CCAMLR process to manage the krill harvest within these (and other) SSMUs.

In order to allow for the regulation of other activities such as scientific research or tourism in CCAMLR designated marine areas south of 60º S, it may be appropriate to consider further collaborative action with the ATCM. However, this would be undertaken as a next step, following agreement by CCAMLR on the designation of candidate areas for protection.

3. CONCLUSION

Implementation of the type of marine spatial protection and management proposed in this paper would be a significant achievement for CCAMLR in contributing to its objective of conservation and rational use of marine biodiversity. By establishing areas where pelagic, benthic and deep water species are given additional protection, CCAMLR has the opportunity to strengthen its precautionary approach in developing a representative network of areas for scientific reference, increased resilience of species to climate change, maintenance of critical ecosystem processes, and conservation of marine biodiversity. The area currently proposed in this paper would have minimal impact on existing fisheries.

Further work is required to confirm whether additional sites would be appropriate to meet the full range of conservation objectives for the South Orkney Islands region. Some components (including benthic areas and the northern pelagic part of subarea 48.2) have not been considered in this preliminary proposal, and ongoing work is underway to identify further candidate sites based on existing scientific information.

The input of experts and stakeholders in reviewing this proposal is essential, and advice from the Scientific Committee and the Commission is required to guide the detail of the special protection to be afforded to such

areas, and how this will be monitored and reviewed in the future. In particular, flexibility is needed in allowing for the locations and provisions of proposed areas to be modified both during the review stages and after adoption, particularly on the basis of new or improved information. Flexibility is also required to ensure that marine spatial protection can be developed as part of a comprehensive and representative network across the Southern Ocean.

At this stage, the Scientific Committee is invited to:

i) Endorse the work undertaken to date and recommend the adoption of a protected area (covering the region marked in Figure 3) contributing towards the conservation of marine biodiversity in Subarea 48.2 (South Orkney Islands), for which special use restrictions including a prohibition on fishing but allowing activities such as some scientific research (to be further elaborated by the Commission) would apply;

ii) Recommend to the Commission that further intersessional work be undertaken in relation to the additional areas of conservation importance identified in this paper, with a view to finalising any further proposals for specific areas for protection around the South Orkney Islands at CCAMLR-XXIX;

iii) Discuss procedures for implementing the type of marine spatial protection proposed in this paper.

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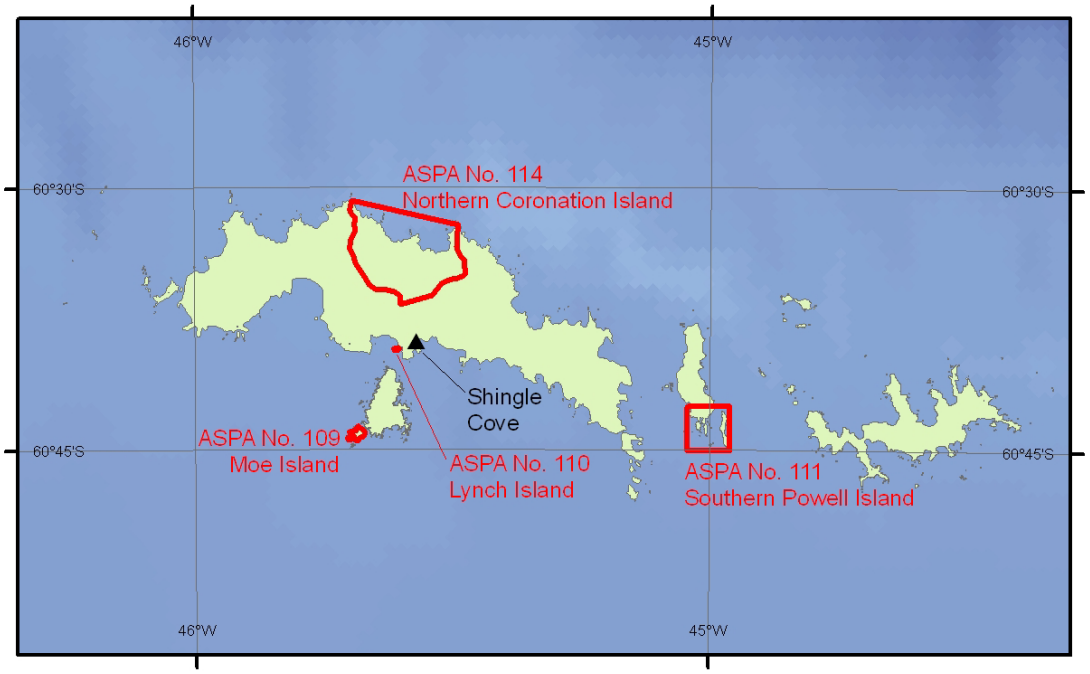
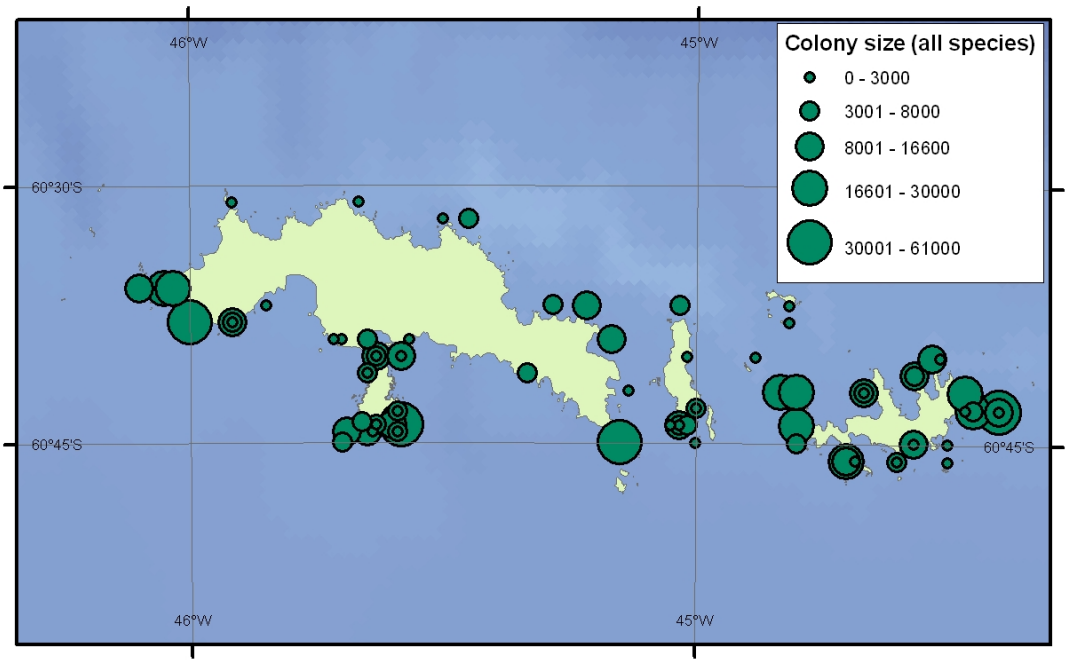
APPENDIX I – Additional spatial data

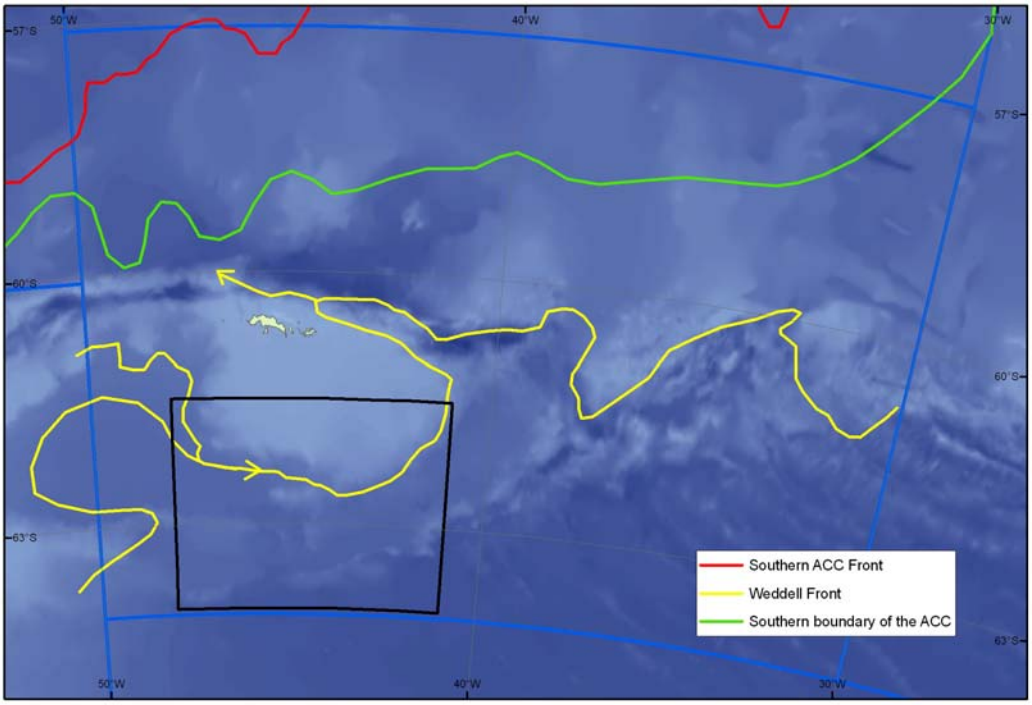
The following maps show information on biological and physical/environmental features, which was collated to provide additional input to decision-making based on the Marxan analysis. Coastal features such as those shown in Maps 1 and 2 have not been considered in detail in this paper, but may be relevant for future work, e.g. the designation of marine ASPAs adjoining coastal areas.



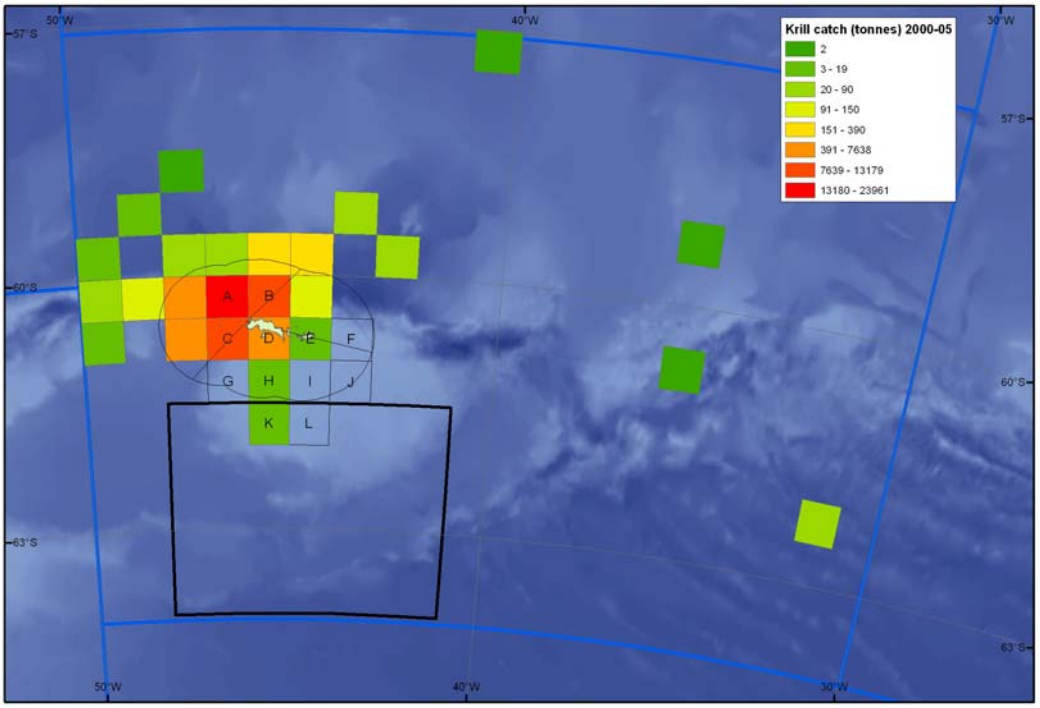
Map 1: Locations of Antarctic Specially Protected Areas (ASPAs, shown in red) in the South Orkney Islands. ASPA Nos. 114 and 111 have marine components and are designated to protect colonies of land-based predators. ASPA No. 109 is terrestrial only, but also protects land-based predator colonies.



Map 2: Locations and sizes of Adelie, gentoo and chinstrap penguin colonies on the South Orkney Islands (data from Ratcliffe & Trathan, in prep)



Map 3: Mean positions of the Weddell Front (yellow) (Thompson et al., 2009), Southern ACC Front (red), and the southern boundary of the ACC (green). The proposed area for protection is also shown (black box).



Map 4: Location and extent of the krill fishery in Subarea 48.2 from 2000 to 2005 (data from CCAMLR Statistical Bulletin, 2006), showing total catches within each fine-scale rectangle during this period. Fine-scale rectangles with letters A to L show the operational area for phase I of the experimental harvest regime for the crab fishery (WG-FSA Report 2008, Figure 2). The existing SSMUs (thin black line) and proposed candidate area for protection (black box) is also shown.

European Commission

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Abstract

SG-ECA/RST 09-03 was held on 19 - 23 October 2009 in Vigo (Spain). The meeting was the 2nd meeting convened in 2009 focussing on the review of stocks of Community interest. STECF reviewed the report during its plenary meeting on 9-13 November 2009.

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